

THE IRON AGE

A Review of the Hardware, Iron, Machinery and Metal Trades.

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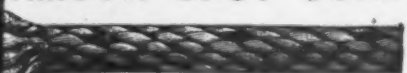
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THE IRON AGE

New York, Thursday, January 4, 1906.

Machine Molding and Continuous Casting of Car Wheels.

The Process as Carried Out at the Plant of the American Car & Foundry Company, Terre Haute, Ind.

The adaptation of the molding machine to car wheel foundry practice has long been sought by manufacturers of cast iron car wheels and has been an inviting field for molding machine manufacturers. On account of the large number of duplicate castings the possibilities of reducing cost of production and increasing the output are on a scale greater than in any other branch of foundry work. Continuous molding and casting systems, both novel and ingenious, have been installed in wheel found-

and pressed, something unobtainable by hand ramming, the result being castings conforming more closely to the patterns. The latter are of metal construction in place of wood and the absence of shrinkage and swelling insures a casting conforming exactly to pattern dimensions. An absolutely uniform distribution of the metal is also secured and this is emphasized in the uniformity of the flange. The car wheel, like the fly wheel and the pulley, requires uniform metal distribution to give as



Fig. 1.—Cope and Drag Molding Machines and Sand Feeders in the Terre Haute, Ind., Car Wheel Foundry of the American Car & Foundry Company.

dries in recent years and have resulted in greatly reduced labor cost and increased output; but in the molding departments, where it was recognized that the greatest saving could be effected, skilled labor has not been displaced. The American Car & Foundry Company, St. Louis, Mo., has combined machine molding with a continuous casting system at its Terre Haute, Ind., car wheel plant. The machines are the invention of J. G. Johnston, superintendent of the Peninsular foundries of the company at Detroit, and they have already been operated a sufficient time to prove their success.

Uniformity of Product a Prime Feature.

The saving effected in labor cost and by increased output at the Terre Haute plant is of minor importance as compared with the superior casting secured from the machine made mold. The sand in each flask by this mechanical operation is always uniformly distributed

nearly perfect balance as possible. The heavy capacity of cars now in use has materially increased the strain on wheel flanges, but conditions of track and of frogs and switches are such that the flange of the wheel cannot be materially increased without great expense to the railroads. The present maximum and minimum of flange dimension is as close as is practical in hand molding, but with the machine made mold such uniformity in the flange is secured that it can be made to the maximum dimension. Naturally this uniformity of metal distribution also results in uniformity of weight, while castings from hand rammed molds often show wide variations from the same pattern.

The molding and casting systems of the car wheel plants of the Pennsylvania Railroad, South Altoona, Pa., and the Central Car Wheel Company, McKees Rocks, Pa., represent important improvements in the method of car wheel manufacture, but in both these plants the

molder continues the all important factor. Floor molding is practised at South Altoona, and a great saving in labor cost is effected through the operation of the most ingenious labor saving devices and the laying out of floors on the most modern lines. The system at the plant of the Central Car Wheel Company is continuous in both molding and casting, the molds being made in flasks on buggies which traverse a circular track. These buggies are connected and move forward for each of the consecutive steps in molding, pouring and shaking out. The molding, however, is done by skilled workmen.

Skilled Labor Dispensed With.

In the operation of the molding machines at Terre Haute no skilled labor is required, as the consecutive steps in the manufacture of both the cope and drag

from the shake out to the storage bins and feeders above the machines, and a rectangular track system on which are operated the trucks that carry the flasks to and from the molding machines. The Terre Haute foundry in which this system is installed is 292 feet long and 80 feet wide and the entire equipment occupies a rectangular space 45 x 203 feet. At the lower end of the foundry are located the 59 annealing pits, with a capacity of 18 wheels each, and they occupy a space approximately 80 x 85 feet.

The molding machines, Fig. 1, located at the upper end of the foundry, are indicated by 1 and 2 in Fig. 7. The drag mold is made on 1, and the cope on 2, and these are shown in Figs. 2 and 3, respectively. The general construction of the machines is that of a press having cast iron bases, with top compression members made



Fig. 2.—Drag Molding Machine.

sides of the mold are exceedingly simple. The lifting in all operations is done by air hoists, and flasks and castings are all transferred on trucks and trolleys. The heaviest work now being done is rapping the sand from the castings, and a special device is being designed to remove the sand from the wheel.

The productive capacity of the plant has not yet been reached on account of the comparatively small melting capacity of the cupola. No single operation in molding requires more than a half minute, which indicates the possibilities of the plant, and while an output of 30 and 35 wheels per hour has already been reached, there is a possibility of producing 50 or 60, the sand handling equipment having a rated capacity of 60 complete molds per hour.

Machine Molding, Sand Conveying and Track Systems.

The Johnston system employs two molding machines, one for producing the cope side of the mold and the other the drag. There is also the sand handling equipment, which tempers, cools, screens and conveys the sand

of steel beams, the two parts of each machine being held together by heavy steel bolts or columns. On the base of each rests a cylinder which supplies the pressures and the circular table rotates from the center, which is one of the supporting columns of each press. The tables have four openings at A', B', C' and D', Fig. 7, which in rotation center over the cylinders which supply the pressure. The tables are supported by castings resting on the base of the press, which are fitted with roller bearings on which the tables rotate. Each of the tables has four patterns, the latter having bosses on their under side, the diameter of which is the same as of the openings in the tables. The boss height is equal to the table thickness. The boss serves two purposes: it is a guide in centering the pattern on the table and it shortens the travel of the piston a distance equal to its height. Directly over each cylinder supported by a swivel or loose pin against the beams are packings or pressure plates. The contour of the plates is practically the same as that of the patterns of the castings to be made. The plates are recessed to

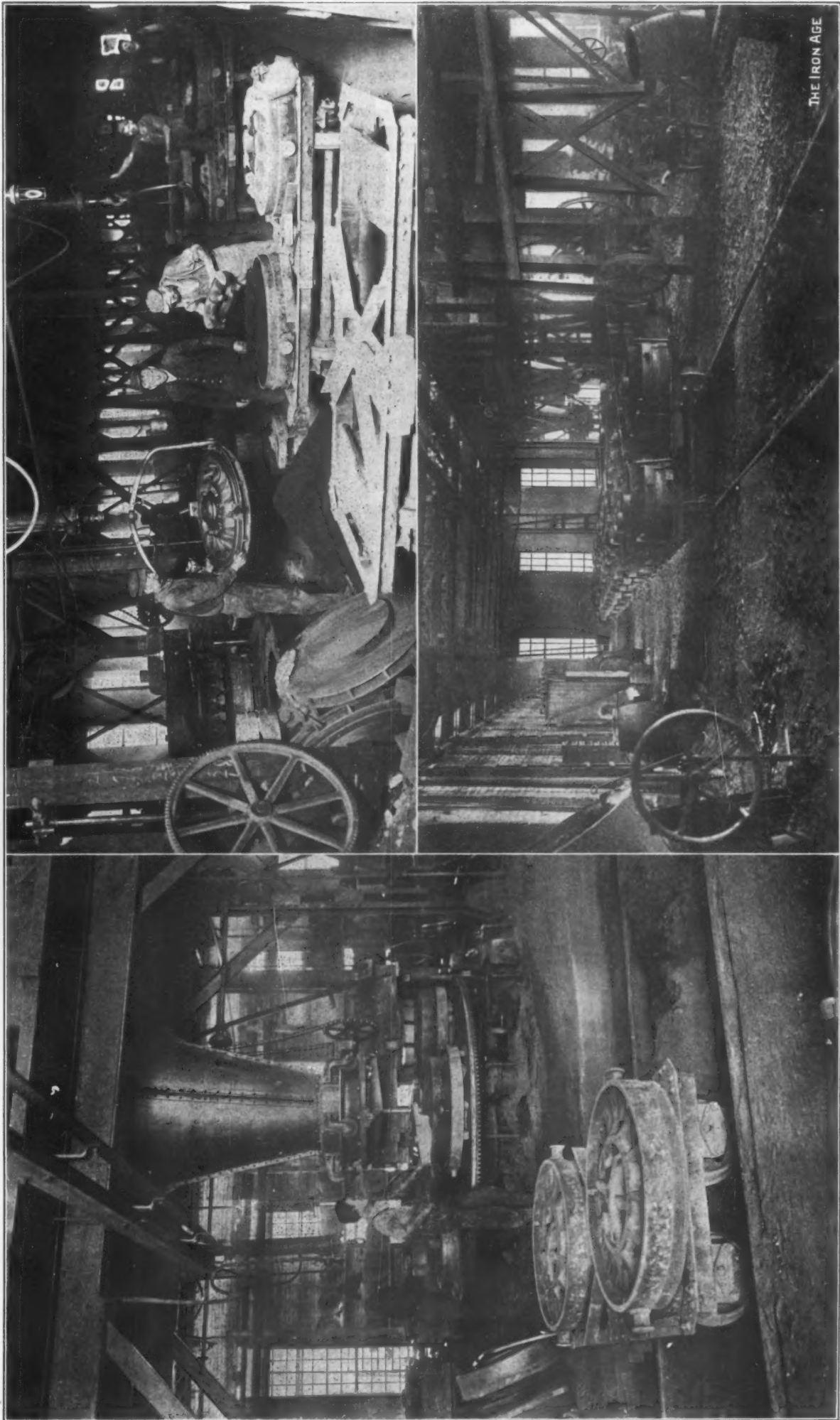


Fig. 4.—Drag Mold on Truck from Which the Pattern Has Just Been Lifted.
Fig. 5.—Finished Molds on Trucks Ready to Be Poured.

Fig. 3.—Cope Molding Machine.—In Foreground Truck from Which Cope Flasks Have Just Been Lifted.

prevent contact with the bars in the flasks, and the swivel supports make them readily adjustable with reference to the bars.

Making the Drag.

The operations in making a mold on the drag machine at 1, Fig. 7, are as follows: Four duplicate patterns are placed on the table, designated as A¹, B¹, C¹ and D¹. A flask is placed over the pattern at A¹, using an air hoist on trolley 10 for that purpose. A quarter turn is given the table, and another flask is placed over the pattern at A¹, and at the same time the flask now at B¹ is filled with sand from the hopper immediately above. A sweep attached to the hopper distributes the sand in the flask and leaves the contour similar to that of the pattern. Another quarter turn of the table and the operation at A¹ and B¹ is repeated, and at C¹ the mold is being pressed.

sufficient quantity of oil at least to fill the smaller cylinder. Air is admitted to tank A by the movement of the lever B through the cock C, forcing the oil into the cylinder E, Fig. 9, through the check valve F and forcing up the piston G, which carries the load to the pressure plate of the machine. At the end of this upward stroke a projecting arm opens the valve H, admitting air into the large cylinder I, Fig. 9, and the upward movement of piston J completes the mold. Returning the lever B to its original position the air is exhausted, the oil returns to the tank and the pistons to their original positions. Oil is used to fill the cylinder E in preference to air, on account of the high pressure on the contents of this cylinder when air has been admitted to the cylinder I. The air is admitted to the large cylinder through a pressure regulating valve and each mold receives the same number of pounds

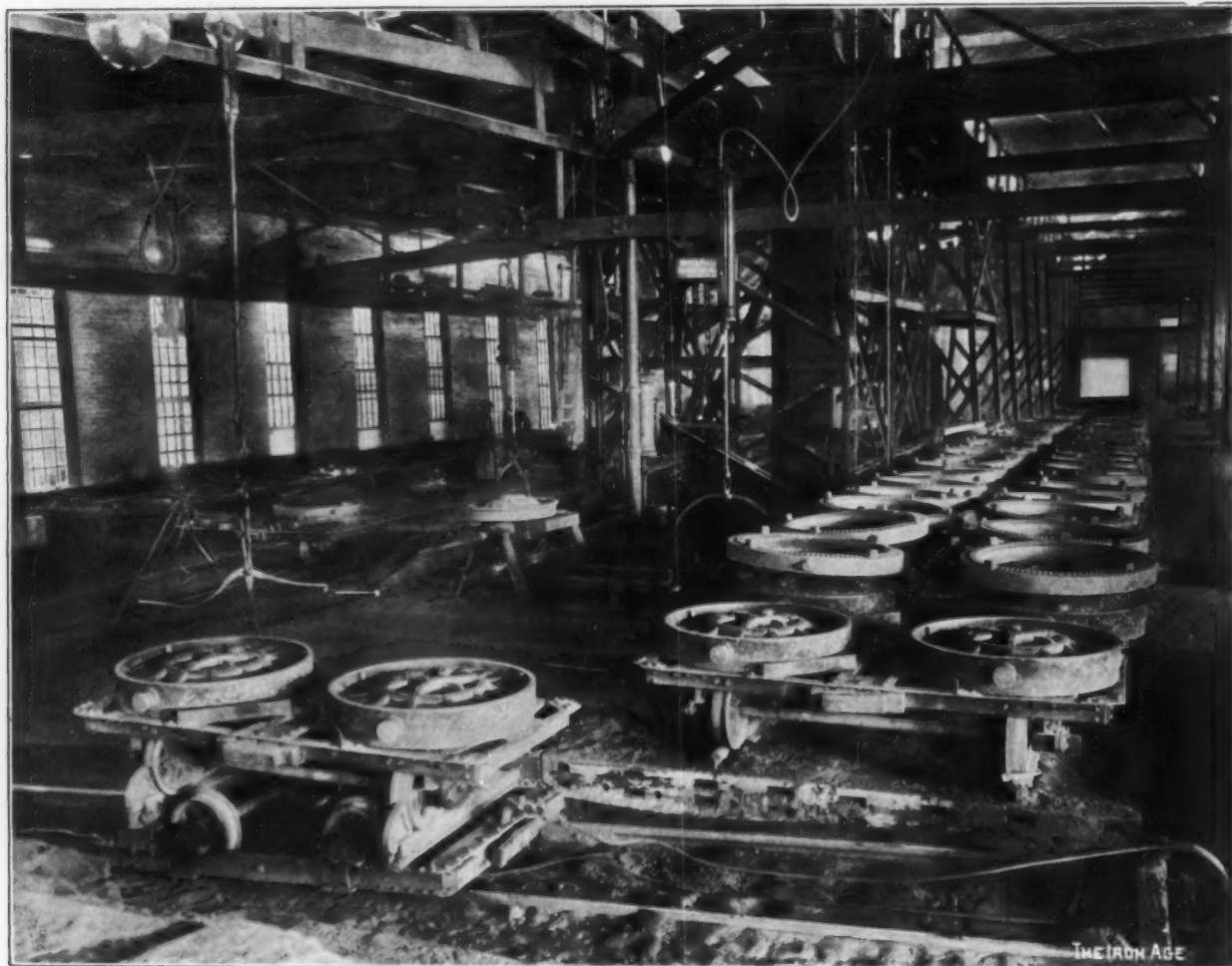


Fig. 6.—Shake-Out Transfer Car.—Flasks on Truck Returning to the Molding Machine.—Sand Handling Equipment on Steel Supports Is Shown, Also Trolley Tracks.

For the pressing operation, a plate on the end of the piston contacts with the boss on the pattern, lifting the pattern, flask and sand up against the pressure plate and continuing the travel until the mold is formed. The pressure being released the pattern with the mold is lowered to the table.

As shown in Fig. 8 the pressure is supplied by two cylinders in combination and designed with reference to the economical use of compressed air. In lifting the pattern, flask and sand up to the pressure plate and in compressing the loose sand only sufficient power is needed to lift the dead weight. The travel in addition to that necessary to compress the loose sand compensates for the irregularity of the contour of the flask and pressure plate. When the table is given the quarter turn there must be sufficient clearance to permit the highest point of sand to pass under the lowest point of the pressure plate.

Details of the Pressure Cylinders.

The piston of the larger cylinder contains the smaller cylinder. In operation the tank A (Fig. 8) contains a

pressure. The travel of the larger piston is but one-ninth of the entire upward movement.

A third quarter turn is given the table and while the operations at A¹, B¹, C¹ are repeated, the pattern and flask at D¹ are clamped together and lifted off the table by an air hoist on the trolley 10a, and after being turned over are placed on a truck on the track 3. The clamp is then loosened and the pattern lifted off and returned to the table, as shown in Fig. 4. It will be noted that the operations at A¹, B¹, C¹ and D¹ are carried on simultaneously.

The same movements are gone through in making the cope side of the mold indicated by 2, Fig. 7, except that at D¹ the mold is lifted off, leaving the pattern on the table. The reason of this difference is that the shape of the drag mold and the distribution of the sand is such that it is not practical to lift the mold off the pattern. The drag mold having been placed on a truck, the truck is moved forward and the cores set in the mold. Another movement of the truck brings it opposite the cope machine when the placing of the cope in position com-

pletes the mold. The bowl into which the metal is poured is made separately and set in place after the mold has been closed.

Pouring the Molds.

The finished molds are now moved along on the trucks on the storage track, Fig. 5, and as soon as 52 of the molds

continues. The section of track 5, Fig. 7, is level, this being directly in front of the cupola, and it is desirable that the molds be level when receiving the metal. Section 4 of this track is used for the storage of the finished molds, and it is desirable to have room on this section to store a sufficient number of molds to allow for any tem-

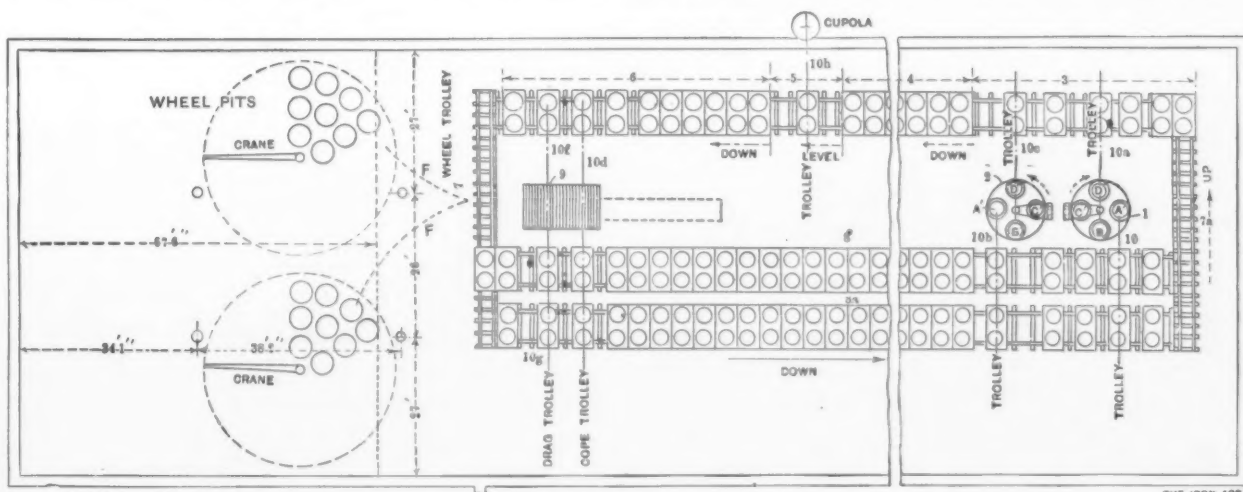


Fig. 7.—General Plan of the Wheel Foundry.

are set up on 26 trucks the blast is put on and the pouring begins. The cupola is situated at about the center of one side of the foundry and the iron is tapped into a five-ton ladle, which insures uniform temperature for all the wheels poured with this iron. From the ladle the iron is tapped into a bottom pour ladle which holds sufficient for one wheel and an additional 50 pounds for a runner. These bottom pour ladles are raised into position by

porary delay at the machine, and if an emergency arises to take care of the metal already in the cupola.

After the wheel has been poured a sufficient time is

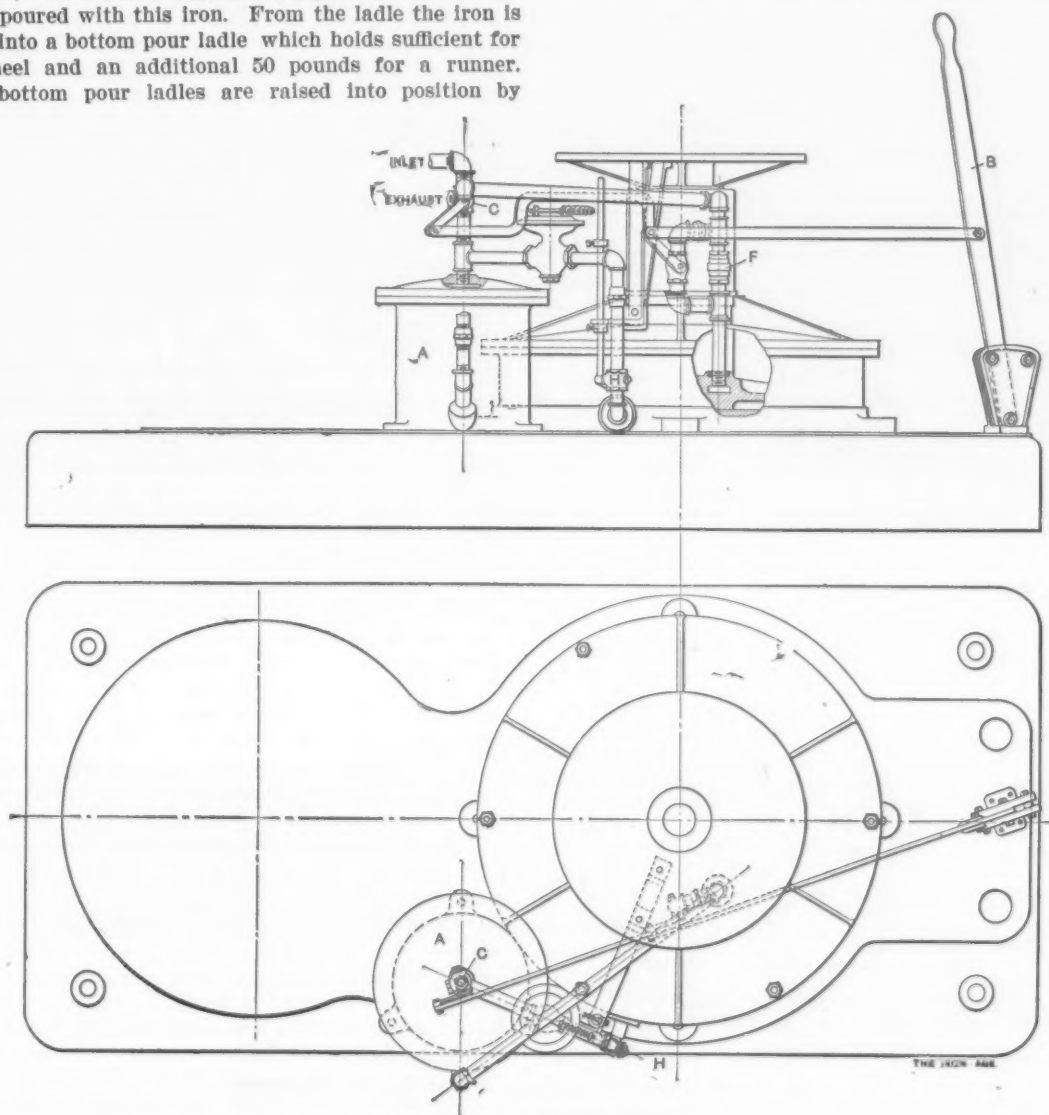


Fig. 8.—Plan and Elevation of Pressure Cylinders.

means of an air hoist on a jib crane. As soon as two molds on one truck have been filled another truck containing two molds is brought up and the same operation

allowed for cooling before it reaches trolley 10d, at which point the cope is lifted off and taken to the grate 9, where the sand is shaken out and falls into the sand pit beneath,

shown in Fig. 6. This cope flask is then deposited on the truck on the track 8, on which the drag flask is already in place. Placing the cope flask on top of the drag flask is desirable, as in moving the trucks forward to the molding machines the cope machine is reached first and the cope flask lifted off, after which the truck is moved forward and the drag flask can be lifted off. When the truck

The flask truck with the drag still on it is placed on the transfer truck on the track 7 and transferred to the track 8 and at trolley 10g the drag is taken to the grate

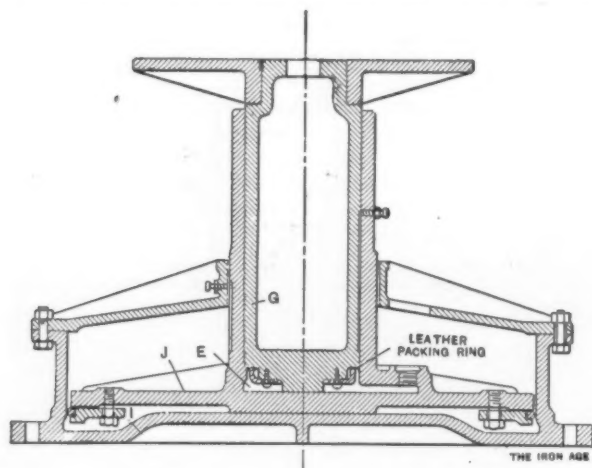


Fig. 9.—Details of Pressure Cylinder.

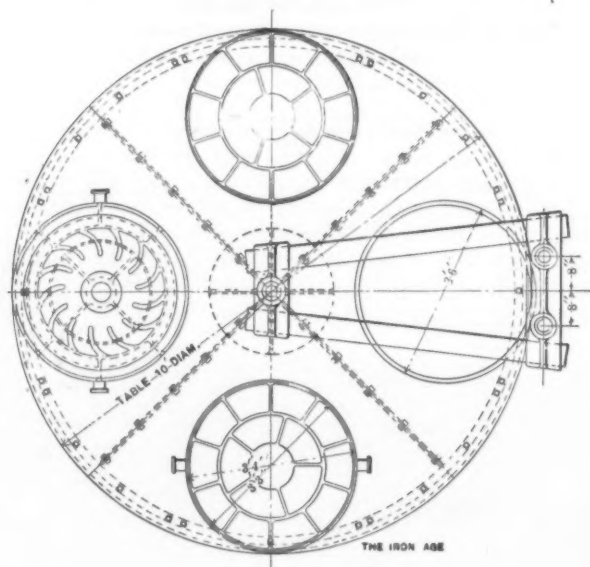


Fig. 10.—Plan of Molding Table.

reaches the trolley 10f the casting is taken to the grate 9, where the sand is rapped off. From the grate it is taken to the pits on trolleys F. These trolleys run on counter-

9, the sand removed and returned to the truck. In order that the flask or more particularly the chiller may have sufficient time to cool before using a second time it is necessary to have the second track, 8a.

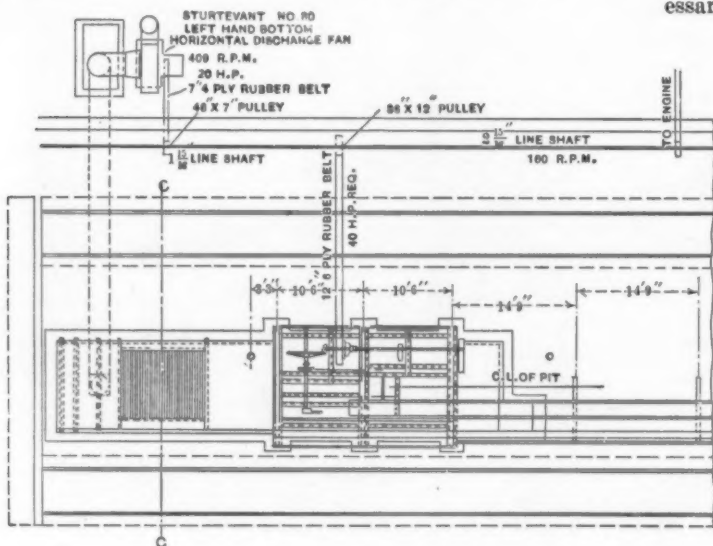


Fig. 11.—Plan and Side Elevation of Sand Handling Equipment.

balanced hinged tracks. The weight of the casting lowers the tracks and the casting is carried down grade to the pits. Relieved of the weight the track rises and the trolley returns to its original position.

Novel Flask Construction.

The construction of the flask in which the drag part of the mold is made, and which is practically the same as that of the cope flask, is both interesting and novel. It

is customary in making the drag side of a car wheel mold to use a ring and bottom plate. The general impression exists that it is dangerous to pour a mold without having the sand supported by a plate or in some way other than by the bars in the flask and more particularly since it is common practice to pour the metal into a car

is 3 feet and a specially designed truck on each is used in transferring the flask trucks. The incline of these short tracks is equal to the incline of the longer tracks. While the trucks run on an inclined track the construction of the car shown in Fig. 13 is such that the rails on the top are level with the rails of the standard gauge tracks

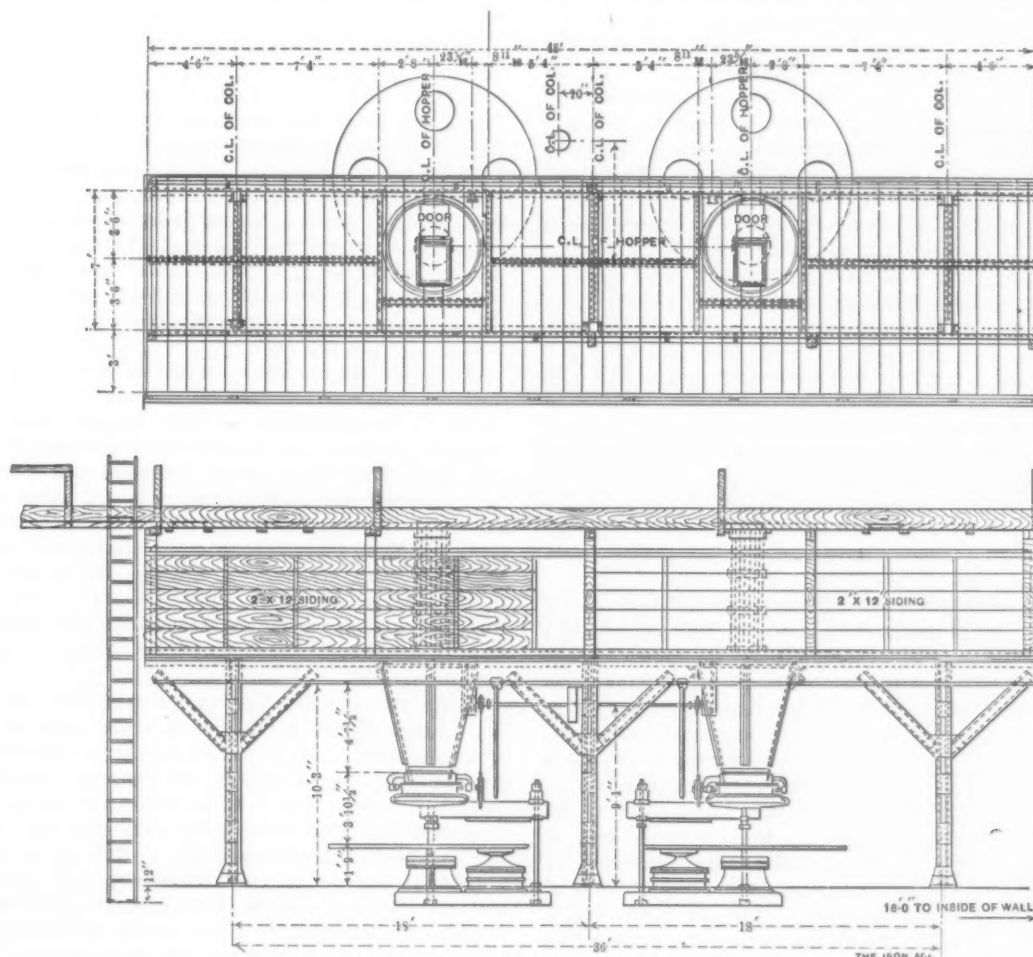


Fig. 12.—Plan and Side Elevation of Storage Platform and Feeders.

wheel mold rapidly and at a high temperature. Considering the pressure per square inch applied in making the mold as compared with the weight of the metal of the mold per square inch it can readily be seen that there is very little more strain on the drag than on the cope side of the mold. In producing several thousands of molds with the machine in a specially designed flask with bars it has been demonstrated to be entirely satisfactory and safe. This feature of the drag flask makes it possible to make the mold by pressing the sand against the pattern. It has been attempted to make the mold by pressing the pattern into the sand, using a pattern with adjustable parts. Such patterns, however, have proved unsatisfactory on account of the rapid wear due to the sand getting in the joints.

Construct on of the Mold Trucks.

The trucks used for conveying the molds to the cupola and shaking out point and for returning the flasks to the machine are constructed of steel shapes with cast iron wheels. The axles are steel and the journals have roller bearings. Spring buffers are attached to each truck, so that when they come in contact the shock does not destroy the mold. Each truck carries two molds. The tracks on which they run are standard gauge and are designated as 3, 4, 5 and 6 on one side and 8 and 8a on the other, Fig. 7. The steel rails are laid on ordinary cross ties with a very slight decline in the direction of travel of the loaded trucks. This decline with tracks and roller bearings for the journals makes it a simple matter to move the trucks. For instance, on the cooling track 8 when a truck is moved forward at the machine all of the trucks on the tracks follow.

Tracks 7 and 7a are oppositely inclined. The gauge

whether at the bottom or top of the incline. The motive power is applied by friction pulleys to a shaft on which is a drum. The car is hauled up grade by the winding

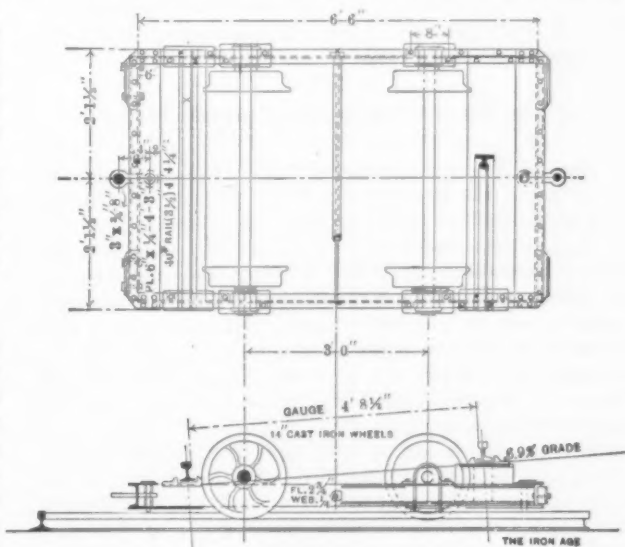


Fig. 13.—Plan and Side Elevation of Transfer Truck.

around the drum of a cable, one end of which is attached to the truck. The return is by gravity.

Sand Conveying Machinery.

The sand handling equipment, shown in Figs. 11 and 12, is one of the important features of the system

and occupies the greater portion of the space inside the rectangular tracks. The sand is received at the shake out, where it passes through double deck hoppers, is tempered, cooled and screened and delivered by reciprocating conveyors to the storage bins, Fig. 12, located above the molding machine.

The sand when shaken out passes through a grating into a double deck hopper, the bottom of whose top section consists of a pair of hinged doors, arranged for dumping the sand from one or two flasks, in the bottom of the hopper. The operation of the doors controls the valve of the water reservoir, allowing a measured quantity of water for tempering to be sprayed on to the sand.

The sand is then fed from the bottom of the hopper to the elevator boot by a reciprocating conveyor. This conveyor is built of steel and has a removable steel hood providing an inclosed space through which the air is drawn for the purpose of cooling the sand. The elevator lifts the sand and discharges it through a chute into a hexagonal revolving screen on the overhead platform. The elevator is of the belt type with steel buckets. The buckets are of large area to afford the largest surface of sand possible to the action of the air draft. The sand is cooled by an exhaust fan, the air being drawn down through the elevator leg, then through the reciprocating feeder conveyor and exhausted outside the foundry building. This fan also draws off the steam rising from the hot sand when sprayed with water and exhausts it outside the building through the elevator leg and the reciprocating feeder conveyor.

The discharge from the reciprocating conveyor to the storage bins is controlled by a series of five gates in the bottom of the conveyor trough over the bins. These gates can be adjusted to distribute the sands equally in the bins or by closing part of them can be discharged at any point desired. There are no screens in the bins; the latter are merely provided for storage to supply the feeders and are designed to be practically self cleaning, as all the sand can be drawn out through the feeders if desired. The two feeders, Fig. 12, one over each molding machine, are conical in shape and of steel construction. They are closed at the bottom by revolving gates and screens and are so arranged that when in operation a fine volume of sand is fed to the patterns, and when the operation is stopped the sand ceases to flow immediately. The operation of these feeders is controlled by means of a lever which engages a friction clutch. When sand is desired the lever is thrown over and the hopper set in motion, and by reversing the lever the friction clutch is disengaged and the revolving gate immediately ceases operation. This equipment has a capacity for handling 20 tons per hour and was designed and installed by Hyel & Patterson, Incorporated, contracting engineers, Pittsburgh.

The Boiler Shop for College Men.

The *American Engineer and Railroad Journal* calls attention to the promising field of activity for college men presented by the boiler shop, as follows:

In vigorous sentences a correspondent discusses the need of leadership talent in the boiler shop and deplores the tendency for young men who are looking for advancement to pass by this department. His letter shows how young men desiring opportunities want to get into the machine shop, where many of them begin and end. If some of them would enter the boiler shop they could fit themselves to earn from \$125 to \$200 per month in as short a time as it can be done anywhere, providing they are qualified to direct the work of other men. A few bright young men would attract attention to this department and assist in securing a better grade of men who are looking for advancement. Boiler work is hard, noisy and disagreeable. A good physique is required, but what becomes of the muscle developed on the "gridiron"? Boiler work would keep this muscle in good condition, and if a young man is successful in the boiler shop he has made an excellent start in his career. It is evident that the boiler shop is to-day in need of improvement and of men. Here is where good men will be able to show their

value quickly, and for this reason this shop ought to be attractive to the young men entering railroad work from the colleges. It offers a better opportunity at present than any other shop department.

Aluminum Production at Niagara Falls.

Niagara Falls has come to be known as the aluminum center of the country, and that it is to continue as such is evident from an announcement just made that the Pittsburgh Reduction Company has contracted with the Niagara Falls Hydraulic Power & Mfg. Company for 27,000 horse-power to be delivered in 1907. The Pittsburgh Reduction Company has also leased four acres of land from the power company, and on this site will erect a fine new works for the manufacture of the white metal. This land extends along the river bank to the north of the present milling district and is ideal for the purpose required, as the New York Central tracks run along it on the east.

It is said to be the intention of the Pittsburgh Reduction Company to erect the largest aluminum works yet built, the first structure to be 600 feet long and constructed of steel and cement, in order that it may be thoroughly fire proof. It is intimated, but not verified, that as the works referred to will not cover the four-acre site the company may intend ultimately to erect other buildings thereon for the manufacture of aluminum wire and other articles. In any event it is evident that the new works will give employment to many hands and that the world's output of aluminum will be very materially increased when this new plant is placed in operation.

Twenty-two years ago the output of aluminum in the United States, so far as recorded, was 83 pounds, and it was not until 1891 that the output reached 100,000 pounds. In 1904, the latest year for which statistics are available, the output reached 8,600,000 pounds, which was an increase of 1,100,000 pounds over the output of 1903. The rapid strides made in the manufacture of aluminum are due to the Niagara power development and the erection of the two present great works at Niagara Falls. One of these plants is located on the lands of the Niagara Falls Power Company and the other is at the edge of the high bank on the property of the Niagara Falls Hydraulic Power & Mfg. Company. Since aluminum has been manufactured in such large quantities in Niagara Falls the price per pound has been very materially reduced, so that it has become a competitor of copper in the erection of power transmission lines in all parts of the country. The electrical industry has profited largely by the development, and it would appear from this latest enterprise of the Pittsburgh Reduction Company that it sees a very bright future before the metal, the consumption of which is likely to increase greatly when the new Niagara plant is ready to help supply the market. Every day appears to develop new uses for the metal, and the economic production at Niagara will continue to benefit many fields to which the metal is and will be applied.

For the use of firemen an ingenious respiratory apparatus consists of a hood lined with oiled silk to cover the head and an air cylinder strapped to the back. Air is supplied from the cylinder to the head piece by means of a rubber tube. The apparatus weighs 23 pounds and can be adjusted in 30 seconds. In a test in San Francisco a man equipped with the apparatus entered a room filled with the fumes of burning sulphur and worked there for an hour without distress, his throat and lungs at the end of the test being perfectly free from the noxious vapor. The pressure and valves are so regulated that a man may obtain enough air to comfortably fill his lungs, but a rapid exhaustion of the supply, such as might be occasioned by fright, is impossible.

The Lackawanna Steel Company, Buffalo, has completed another open hearth steel furnace, making 11 now available.

Coke Making in the United States.

Recent Developments to Meet Present and Future Requirements.

BY EDWARD W. PARKER, WASHINGTON, D. C.

Probable Life of the Connellsville Basin.

Coincident with the record making activity in the iron and steel industries which has prevailed during 1905 the production of coke in the United States has exceeded that of any previous year in our history. All of the old regions have for the most part been pushed to their capacity, or at least to the fullest extent permitted by the supply of railroad cars for shipping the product, while a marked feature of the year has been activity shown in the development of new coking coal areas. It is an open secret that at the present rate of production the Connellsville basin will be exhausted in from 25 to 30 years, and even this brief term of life will be shortened by an increasing drain upon the reserves. The Connellsville basin is estimated to have contained originally 137 square miles, or 87,700 acres, of the Pittsburgh bed, which here has an average thickness of about 7 feet. Estimating 1100 short tons to the foot acre and a recovery of 90 per cent., which is said to be attained, the total available supply when production began was about 600,000,000 net tons. About one-third of the coal has already been worked out, so that, say, from 55,000 to 60,000 acres, or approximately 425,000,000 net tons, remain unmined. During the last five years the coke production of the Connellsville region has averaged 10,000,000 net tons, equivalent to 15,000,000 net tons of coal. At this rate, exclusive of any of the coal sold or used at and near the mines in operating the properties the entire bed will be exhausted inside of 30 years.

But while Connellsville coal is the ideal coking coal particularly for beehive ovens and although this region has for many years produced over 50 per cent. of the total coke product of the United States there is no reason why ironmasters and other coke consumers should feel any apprehension as to their supplies of fuel when Connellsville coke shall have ceased to be a factor in the trade. There are still large areas of good coking coal lands practically untouched throughout the Appalachian field and the active development which has been in progress during the past year in the other coke producing regions indicates that provision is being made for future requirements. In the Connellsville region itself the H. C. Frick Coke Company has added largely to its previous equipment, namely, 500 ovens at Yorkrun, 500 at Shoof and 200 at Bitner, all in Fayette county. Some ovens in the region have been abandoned, but the total number at the close of 1905 will show an increase of about 800 over those in existence at the beginning of the year.

The Klondike and Greene County Districts.

The next field in importance to that of the Connellsville, at least for the immediate future, is what is known as the Klondike or Lower Connellsville district, located entirely in Fayette County and lying to the west of the southern end of the Connellsville basin, from which it is separated by the Greensburg anticline. This region was opened up in 1900, and although only six years old is the second coke producing district of the country, having in 1902 and since that date exceeded that of the Pocahontas district of Virginia-West Virginia. At the close of 1904 there were in the Lower Connellsville district 6570 ovens. About 1000 ovens are reported as building in this district at the close of 1905. Among these are the Husted-Semans Coal & Coke Company, 200 ovens; the Century Coal & Coke Company, 170 ovens (additional to its present plant of 30 ovens); the Republic Iron & Steel Company, adding 378 ovens to the plant of 138 ovens taken over from the Connellsville Coke Company; the Struthers Furnace Company, 200 ovens; the South Fayette Coke Company, 60 ovens, and the Washington Coal & Coke Company, 300 ovens, increasing its total equipment to 1000 ovens.

It is, however, the opinion of Fred C. Keighley of Uniontown that the Greene County coal fields of Pennsylvania will probably be the scene of the next greatest development in the line of coke making. Into this county, which lies in the extreme southwestern corner of the State, the railroads have as yet barely penetrated. Washington County, containing the noted Pittsburgh and Youghiogheny districts on the north, and Fayette County, embracing the Klondike field and the southern half of the Connellsville basin on the east, have been highly developed; but the coals of Greene County, lying at greater depth and requiring greater outlay in the construction of plant and probably greater expense in operation, have not offered the same inducements to capital as have other portions of the State. The great demand for coke during 1905, the prices obtained and the fact that other coking coals must be secured have attracted attention to the untouched lands in Greene County, with the prospect that this field will be developed at an early date, and from what is known of the character and quantity of the coals it may not be unsafe to predict that when once begun the development will eclipse the somewhat notable record made by the Lower Connellsville or Klondike region.

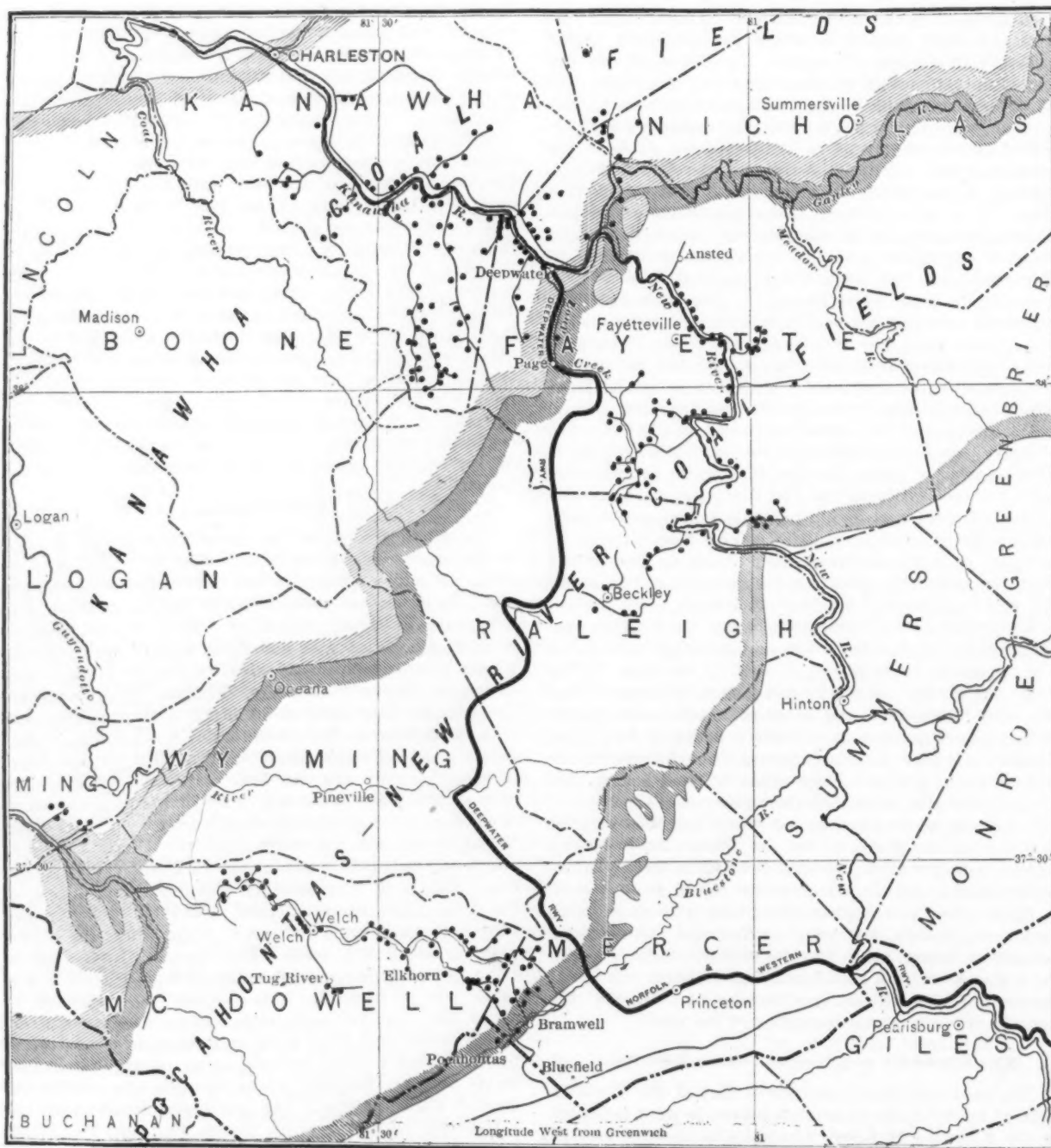
West Virginia.

Immediately south of the Lower Connellsville district in Pennsylvania is a newly developed field in West Virginia. The development of this district has been brought about by the recent construction of the Morgantown and Kingwood Railroad, owned by United States Senator Stephen B. Elkins and associates and of which Davis Elkins is president. They also control the Elkins Coal Company, formerly the West Virginia Coal Company. The coal company owns about 40,000 acres of coking coal land lying between Morgantown and Rowlesburg, in Monongalia and Preston counties. The district has been developed within the last two years and while at the close of 1905 there were only three plants in operation it is considered a highly promising district. The coal being mined is not the Pittsburgh, but the Upper Freeport, which through this region shows excellent coking qualities. The West Virginia Coal Company opened two of the three mines, one at Richard, where 150 beehive ovens have been constructed and one at Bretz, where the coking plant numbers 267 ovens. The Deckers Creek Coal & Coke Company has opened up at Dellslow, a short distance west of Richard. This company has completed 20 ovens and has 200 more under way. Another district which promises to be of some importance in the future is located in the western central portion of the State. The Davis Colliery Company, whose interests also control the Coal & Coke Railroad, has purchased 50,000 acres of Pittsburgh coking coal on Copen Run, in the Little Kanawha district. The company has also purchased 400 acres of surface for the construction of its mining and coking plant, miners' houses, terminal facilities, &c. Active development will probably begin early in 1906.

The development of coking coal lands in West Virginia which has probably attracted the most general attention during the last year is that which has been made possible by the building of the Deepwater-Tidewater Railroad, now under construction from Deepwater on the Kanawha River, a short distance below Kanawha Falls, to Sewall's Point, near Norfolk, Va. This line of railroad from Deepwater to the Bluestone River, a distance of 85 miles, will run, every mile of it, through coking coal lands of the Kanawha-New River-Pocahontas series, as shown on the accompanying map of that section of West Virginia. With lateral branches along the valleys of the Kanawha, Coal and Guyandotte rivers, there will be developed a coal area of 3000 square miles within 20 miles of the main line. Track is now laid from Deep-

water through Jenny's Gap to within a few miles of the Guyandotte River, Jenny's Gap being 45 miles and the Guyandotte 60 miles from the present terminal at Deepwater. It is expected that connection with the Norfolk & Western Railroad at the Bluestone River will be completed by April, 1906. The entire line to Sewall's Point is under contract, the provisions of which require its completion by January 1, 1908. The Deepwater end of the line is in operation for a distance of 50 miles and con-

cured. The entire plant of 505 ovens was completed in August and the first coke was made in September. The daily capacity of this plant will be about 600 tons of 72-hour coke. It is laid out for an additional 500 ovens, but work on this addition has not yet begun. The 505 ovens will consume 1000 tons of coal daily. The coal is charged by a train of three larries, coupled so as to exactly fit the openings in the charging bin, as well as in the ovens, consequently the coupling and uncoupling is avoided. One



The Coke Section of West Virginia Traversed by the Deepwater-Tidewater Railroad.

siderable progress in track laying has been made on the 103 miles of grading completed at the Norfolk end.

The Loup Creek Colliery.

Almost coincident with the beginning of work on the Deepwater Railroad, development of the coal lands owned by the Loup Creek Colliery Company, at Page, 15 miles from Deepwater, was commenced. As this plant represents an excellent idea of a good deal that is best in the way of modern construction and might be taken as a model for economical operation, a brief description will be of interest.

The plant has at present 300 ovens in blast and a total of 505 completed. The 205 can be put in blast as fast as transportation facilities for the coke can be se-

of the three larries is provided with two 35 horse-power motors and the other two are trailers. The power is supplied by two Nordberg-Corliss engines of 300 horse-power, each coupled to the same shaft, and the electrical power for the larries is furnished from a 150-kw. generator, arranged for a duplicate generator whenever it may be required. Water for the ovens is supplied from a reservoir holding 375,000 gallons at an elevation of 90 feet above ovens. Nine months in the year this reservoir is filled by an 8-inch gravity pipe from Murphy's branch. There is also in reserve a dam in Loup Creek which impounds 1,500,000 gallons, where is installed a two-stage centrifugal pump operated with a direct acting electric motor, and which discharges a 9-inch stream into the res-

ervoir. The average haul from the slack bin to the 500 ovens completed is 1046 feet, the longest haul being 1500 feet and the shortest 300 feet. It is claimed, and probably correctly, that this is the most compact oven plant in the United States. The coke tracks connect with the main line of the Deepwater Railroad at the north end of the ovens, while the coal tracks connect at the south end, both connections having gravity tracks with 1 per cent. grade. The total capacity of the mines now is about 700 tons daily, which will be increased as rapidly as possible, as demonstrated by the last three months' operations, which began September 1. In September the output of coal was 7911 tons, in October it was 11,279, in November 13,565, and the company hopes to report a production of 18,000 tons for December. The coke shipments for September were 500 tons, in October 3100 tons and 4800 tons in November. Coke shipments for December will probably reach 5000 tons.

been in the way of increased yield of both coke and gas per oven, in the improved quality of gas and in long-distance transmission of the gas under pressure. The industry has also advanced in the number of ovens in regular operation and the field for the disposal of its products has enlarged.

The well-known hesitancy on the part of blast furnace managers to commit themselves to an unfamiliar fuel, the physical appearance of which is somewhat against it, is gradually yielding to the effects of successful experience with by-product coke. That this is the case is indicated by the recent addition of 112 United-Otto ovens to the existing plant of the Cambria Steel Company at Johnstown, Pa., this being the fourth installment and making the total number of ovens at that place 372.

The following list gives the by-product coke ovens built and under contract by the United Coke & Gas Company up to date in this country:

By-Product Coke Ovens Built and Under Contract by the United Coke & Gas Company in the United States.

Company.	Install-ment.	No. of ovens.	Use of coke.	Use of gas.
Cambria Steel Company, Johnstown, Pa.....	1st.	60	Blast furnace.....	Fuel and power.
Cambria Steel Company, Johnstown, Pa.....	2d.	100	Blast furnace.....	Fuel and power.
Cambria Steel Company, Johnstown, Pa.....	3d.	100	Blast furnace.....	Fuel and power.
Cambria Steel Company, Johnstown, Pa.....	4th.	112	Blast furnace.....	Fuel and power.
Pittsburgh Gas & Coke Company, Glassport, Pa.....		120	Blast furnace and domestic.....	Fuel and illuminating.
New England Gas & Coke Company, Everett, Mass.....		400	Domestic and locomotive.....	Illuminating.
Hamilton-Otto Coke Company, Hamilton, Ohio.....		50	Foundry and domestic.....	Illuminating.
Lackawanna Steel Company, Buffalo, N. Y.....		564*	Blast furnace.....	Fuel.
Lackawanna Steel Company, Lebanon, Pa.....		232	Blast furnace.....	Fuel.
S. Jersey Gas, Electric & Traction Company, Camden, N. J. 1st.		100	Foundry and domestic.....	Illuminating.
S. Jersey Gas, Electric & Traction Company, Camden, N. J. 2d.		50*	Foundry and domestic.....	Illuminating.
Michigan Alkali Company, Wyandotte, Mich.....	1st.	15	Lime kilns.....	Fuel.
Michigan Alkali Company, Wyandotte, Mich.....	2d.	15*	Lime kilns.....	Fuel.
Maryland Steel Company, Sparrows Point, Md.....		200	Blast furnace.....	Illuminating.
Sharon Coke Company, South Sharon, Pa.....		212	Blast furnace.....	Fuel.
Zenith Furnace Company, Duluth, Minn.....		50	Blast furnace.....	Illuminating.
Total.....		2,380		

* Not completed.

Other Developments in West Virginia and Kentucky.

The most striking instance of the securing of new coking coal lands by interests identified with large iron and steel industries is shown in the developments recently made by the United States Coal & Coke Company in the Tug River district of McDowell County, West Virginia. This company has a plant of about 1350 ovens, which will undoubtedly be increased as conditions require. It owns several thousand acres of coking coal lands.

The principal developments in the older coking regions of West Virginia have been made in the Pocahontas, or Flat Top, district, embraced in McDowell and Mercer counties. Three entirely new companies have entered this field—namely, the Cherokee Colliery Company at Ashland, the Hiawatha Coal & Coke Company at Hiawatha and the Page Coal & Coke Company at Upland. All of these are located in McDowell County. The Pocahontas Consolidated Company has taken over the properties of the Norfolk Coal & Coke Company, the Rolfe Coal & Coke Company and the Shamokin Coal & Coke Company, in McDowell County, and the Caswell Creek Coal & Coke Company in Mercer County, and has added several hundred new ovens. Other companies that have enlarged their plants are the Ashland Coal & Coke Company, the Indian Ridge Coal & Coke Company, the Crane Creek Coal & Coke Company and the Pinnacle Coal & Coke Company.

A considerable amount of attention is now being attracted to the Elkhorn and other coking coal fields of eastern Kentucky. There are in this region vast areas of high grade coking coals which are only waiting for the railroads now building to them to prove an important source of coke supply.

The coal mining and coke making industry of Alabama has been, if not seriously injured, at least held back by the strike of the union miners, which has been in force against several of the larger plants operated in connection with blast furnaces. The mines have been kept in operation with nonunion labor, but necessarily with restricted output.

By-Product Coke.

The principal development in by-product coke oven practice in the United States during the past year has

The most recent additions, aside from the Cambria installation, are the 50-oven extension to the Camden plant (New Jersey) and the construction of 15 additional ovens at the Wyandotte plant (Michigan).

Aside from the extended use of by-product coke in blast furnaces and foundries the use of crushed and sized coke for domestic and industrial purposes as a substitute for anthracite and bituminous coal has increased notably. The plant at Camden has restricted its output for foundry purposes and now relies mainly upon the domestic trade in Camden, Philadelphia and vicinity, which has been such as to justify an increase in oven capacity of over 50 per cent. The plant at Hamilton, Ohio, has added to its equipment for crushing domestic coke, and a larger proportion of its output than ever before now goes to this field. The plant at Glassport, Pa., has also found that the demand for domestic coke was sufficient to justify the installation of improved crushing equipment. At Everett, Mass., practically the pioneer plant in this direction, the coke product is now easily and regularly disposed of, it being about equally divided between domestic or industrial uses and fuel for locomotives in suburban traffic.

Gas from By-Product Ovens.

As a producer of illuminating gas the by-product coke oven has steadily gained ground. The method of separation of gases is now generally recognized as the most advantageous system. This consists in dividing the gas evolved from the coal into two portions, the first part being of higher illuminating and calorific value, known as the "rich" fraction. The second portion is of lower quality and is known as the "poor" or fuel portion. It is used for heating the ovens, which by their construction are necessarily heated by gas, though not necessarily by their own gas. The rich gas is available for illuminating or other purposes and comprises from 30 to 50 per cent. of the total volume of gas obtained from the coal, varying with the quality of the latter. Compared with ordinary coal gas it is usually of equal or better illuminating and calorific value, although not made from gas coals, this being due to the method of fractional distillation, by which only the best of the gas is taken.

One handicap to the advantageous disposal of by-product coke oven gas has been that where ovens have

been built for supplying coke to blast furnaces the immediate vicinity of the plant did not have population enough to absorb the disposable gas. Under such circumstances the long distance transportation of gas in pipe lines under pressure has come into use.

Gas from by-product coke ovens at the plant of the Maryland Steel Company at Sparrow's Point, Md., is now regularly pumped to Baltimore through a pipe line about 9 miles in length under a pressure of approximately 5 pounds and under all weather conditions. Between 4,000,000 and 5,000,000 cubic feet per day is thus delivered to Baltimore, forming a large portion of the total illuminating gas consumption of that city.

Gas from the by-product ovens of the South Jersey Gas, Electric & Traction Company at Camden is now regularly pumped through pipe lines to Trenton, N. J., a distance of 38 miles, under an initial pressure of about 10 pounds. This is accomplished without any appreciable drop in the illuminating value of the gas after transportation, even under extreme weather conditions.

The Camden plant is also notable as being the first to install the process of gas enrichment by benzol transfer on a large scale. This process has been developed by the United Coke & Gas Company and consists in removing the benzol from the "poor" or "fuel" fraction of the gas by scrubbing with tar oil. The benzolized oil is then subjected to fractional distillation in a still through which a current of rich gas passes and the highly benzolized gas is mixed subsequently with the main volume of "rich" or illuminating gas, thus adding to the illuminating power of the latter by some 4 or 5 candle-power. As the enrichment is made by practically pure benzol it is said to be permanent in its character at the temperatures and pressures prevailing in a gas distribution system; the enriched gas therefore reaches the consumer with all of its illuminating value. The process also possesses advantages because of the simplicity and low operating cost of the apparatus, and as it uses the benzol already at hand the enrichment is obtained for practically the nominal operation charges.

In the construction and operation of the by-product oven the advances made have been of a minor character, affecting the details of the process. The oven capacity has been gradually increased, the dimensions added to being those of height and length rather than width. The process of compressing the coal into a cake, which is charged into the oven in one piece through the end instead of filling the loose coal in at the top charging holes, has not grown in favor, principally because of its high cost of installation, slow operation and the trouble with freezing in winter.

Numerous improvements have been made in the machinery accessory to the by-product ovens, among them being a new form of coke quencher, in which the coke is quenched and loaded into cars by one man, the quenching water being applied in a closed receptacle, so that the silver-gray color of beehive coke is reproduced and at the same time excessive moisture in the coke is avoided.

Semet-Solvay By-Product Ovens.

In the Semet-Solvay type of oven the principal feature of which is the horizontal flues, as against the vertical flue construction in the United-Otto, Otto-Hoffman and Schniewind ovens, the main progress during the year has been in output of plant. This has been brought about chiefly by the "five-high" oven, which has been thoroughly tested, and has proved, it is claimed by the builders, an entire success. These enlarged ovens have a capacity of from 5 to 10 tons of coal, and at some of the plants operated by the Semet-Solvay Company a coke satisfactory for either furnace or foundry use has been produced in 18 hours.

Among the more recent construction of the Semet-Solvay ovens in this country is a plant having a capacity of 400 tons of coal per day at Tuscaloosa, Ala., and another of 120 ovens at Chicago. There is under construction for the Pennsylvania Steel Company a plant of 120 ovens at Steelton, Pa. The plants at Tuscaloosa and Steelton are for the production of furnace coke, while the production of the one at Chicago will probably be divided between furnace and foundry. In fact, practically

the entire output of Semet-Solvay coke is consumed in furnaces and foundries. It has proved especially successful as a foundry fuel, a number of records of low fuel consumption per pound of iron melted having been made with it.

The Semet-Solvay plants built and under construction at the close of 1905 are as follows:

State.	Locality.	No. of ovens.
Alabama.....	Ensley.....	240
Alabama.....	Tuscaloosa.....	40
Illinois.....	Chicago.....	120
Michigan.....	Delray.....	120
New York.....	Geneva.....	30
New York.....	Syracuse.....	40
Pennsylvania.....	Dunbar.....	110
Pennsylvania.....	Sharon.....	25
Pennsylvania.....	Chester.....	40
Pennsylvania.....	Lebanon.....	90
Pennsylvania.....	Steelton.....	120
West Virginia.....	Benwood.....	120
Wisconsin.....	Milwaukee.....	160
Total.....		1,255

The plants of ovens at Lebanon and Steelton, Pa., and at Tuscaloosa, Ala., are all of the "five-high" type.

Coking Noncoking Coals.

During the Louisiana Purchase Exposition some interesting experiments were made by Dr. Joseph Hyde Pratt at the coal testing plant of the United States Geological Survey, along the line of coking what are generally considered noncoking coals. The experiments consisted of thoroughly mixing coal with coal tar pitch, briquetting the mixture and charging into the ovens. These experiments indicated that it is possible to considerably increase the coking qualities of certain coals, but they were not continued for a sufficient length of time to obtain conclusive results. They indicated, however, that a mixture briquetted would when burned in the oven produce a better coke than the same mixture not previously briquetted. The results are sufficient to warrant further experimentation on these lines.

The writer is under considerable obligation for information contained in this article to F. C. Kelghley, general superintendent Oliver & Snyder Steel Company, Oliver, Pa.; Davis Elkins, president West Virginia Coal Company; Maj. William N. Page, president Gauley Mountain Coal Company and the Loup Creek Colliery Company; Dr. F. Schniewind and C. G. Atwater of the United Coke & Gas Company, New York, and W. H. Blauvelt of the Semet-Solvay Company, Syracuse, New York.

Steam turbine economy was the subject of an address given recently by Charles Parsons, C. B., before the Institution of Civil Engineers of Great Britain. Recent improvements in the form and curvature of the blades, he explained, have resulted in an increased economy, and the building of larger sizes has also brought about better efficiency. If the vacuum is increased from 26 to 27 inches the steam consumption is decreased 4 per cent.; with 28 inches it is further decreased 4½ per cent., and with 29 inches, which the speaker maintained was easily possible, the steam used is cut down 5½ per cent. more. Comparing the operation of the Clyde steamers, it was stated that a gain of 15 per cent. in favor of the turbine steamers had been realized. The King Edward and Queen Alexandra make 9 miles on 1 ton of coal, at mean speeds of 20 and 21 knots respectively. The Brighton, with turbines, burned 10 per cent. less fuel than her sister ship Arundel, with reciprocating engines, both making the same speeds. In the turbine steamers there is also a saving in attendance and oil consumption.

For large internal combustion motors a mixture of equal parts of alcohol and benzole has been found to give good results and to be safe. The best mixture, so far as efficiency goes, seems to be that containing from 15 to 20 per cent. of benzole. In automobile engines 30 per cent. benzole has been found most advantageous. Outside of those in automobiles it is estimated that there are in use in Germany more than 2000 stationary and portable engines using alcohol as a fuel. In 1903-1904 these engines consumed more than 950,000 gallons of alcohol.

A Cincinnati Heavy Pattern Gang Drill.

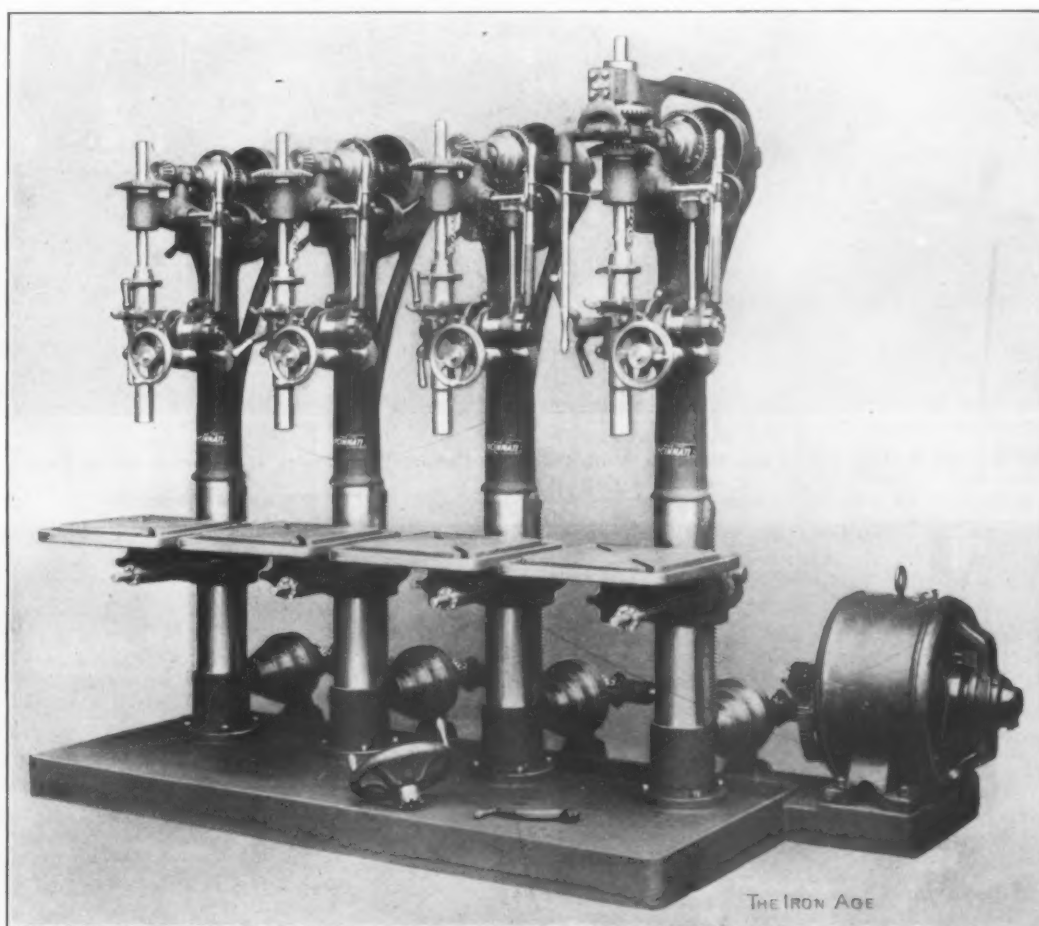
An interesting way of combining a number of standard drills to form a gang drill is shown in the accompanying engraving. This particular combination consists of four of the heavy pattern 21-inch drills manufactured by the Cincinnati Machine Tool Company, Cincinnati, Ohio, all mounted on one base and arranged for motor drive.

All of the machines are complete with wheel and lever feed, back gears, power feed and quick return of the spindle and the right hand drill has in addition a patent geared tapping attachment. Square oil grooved tables are substituted for the round tables generally furnished and it is the intention that this machine shall have a pump and proper piping for conveying the lubricant directly to the drills and returning it to the pump. The raising and lowering device on the tables is different

cost of the equipment and upkeep, on the one hand, and the coal economy, on the other. It is estimated that the cost of applying a superheater is at present somewhere in the neighborhood of \$1000. A 200,000-pound freight engine running 30,000 miles per annum will burn 2500 tons of coal, which, at \$2 per ton, will cost \$5000. It being evident from experiments that a saving of about 10 per cent. in coal may be expected, it follows that the cost of the superheater outfit would be covered in two years' running. Much, of course, would depend upon the local conditions of the case to be treated, but the above figures were estimates made for the Canadian Pacific Railway.

The World's Petroleum Output.

The United States supplied more than one-half of the petroleum produced in the world in 1904. A statement



A Gang Drill Consisting of Four 21-Inch Standard Drills, Manufactured by the Cincinnati Machine Tool Company.

from the one used on the standard drills, being operated from the front.

In the combination illustrated the four drills are driven simultaneously by one shaft extending at right angles to the individual driving shafts of the machines. The main shaft is driven through spur gears by the motor and is connected with each machine through miter gears. This driving arrangement can be modified and any other substituted to suit the requirements of the shop where the drills are to be used.

The arrangement of the drills themselves can also be modified quite extensively, as the machine may be furnished with or without the patent geared tapping attachment, with or without back gears, with or without power feed, with or without square or round tables or with one special continuous table. This equipment suggests many other possible combinations that might be made to suit special classes of work, and the company invites opportunities to suggest designs to meet the individual manufacturer's needs.

The problem of superheating steam used on locomotives has come to be largely a question between the extra

of the world's production of petroleum, prepared by the British Board of Trade, which has just reached the Bureau of Statistics of the Department of Commerce and Labor, puts the petroleum production of the world in 1904 at 9,303,000,000 gallons, of which 4,916,000,000 gallons were produced in the United States, 3,650,000,000 gallons in Russia, 202,500,000 gallons in Austria, 206,500,000 gallons in Java and Sumatra, 135,000,000 gallons in Rumania, 105,500,000 gallons in British India (principally Burma), 49,000,000 gallons in Japan, 20,000,000 gallons in Canada and 18,500,000 gallons in Germany.

The world's production for 1904 breaks all records. In 1903, which made the highest record of any year prior to 1904, the total production was only 8,504,000,000 gallons and in 1902 it was 7,588,000,000 gallons. The increase in 1903 and 1904 was chiefly in the United States. The United States and Russia produce practically nine-tenths of the petroleum of the world.

The Oliver Iron & Steel Company, Pittsburgh, has recently bought considerable ground adjacent to its mills which will be used for extensions to the present plant, definite plans for which have not yet been made.

The Steamer Hoover and Mason.

Description of the New Lake Ore Carrier Having Transverse Hoppers.

A radical departure in the construction of ore carriers on the Great Lakes is represented by the steamer Hoover and Mason, designed by the Chicago firm of con-

Approximately one-third of the time required for the unloading of the ordinary type of lake carrier is consumed in handling the last 15 per cent. of the cargo by shovelers, so as to make it accessible to the unloading machinery. The effort to eliminate this hand trimming led to the construction several years ago of carriers of the W. E. Corey and E. H. Gary type, having longitudinal hoppers extending the length of the cargo hold and

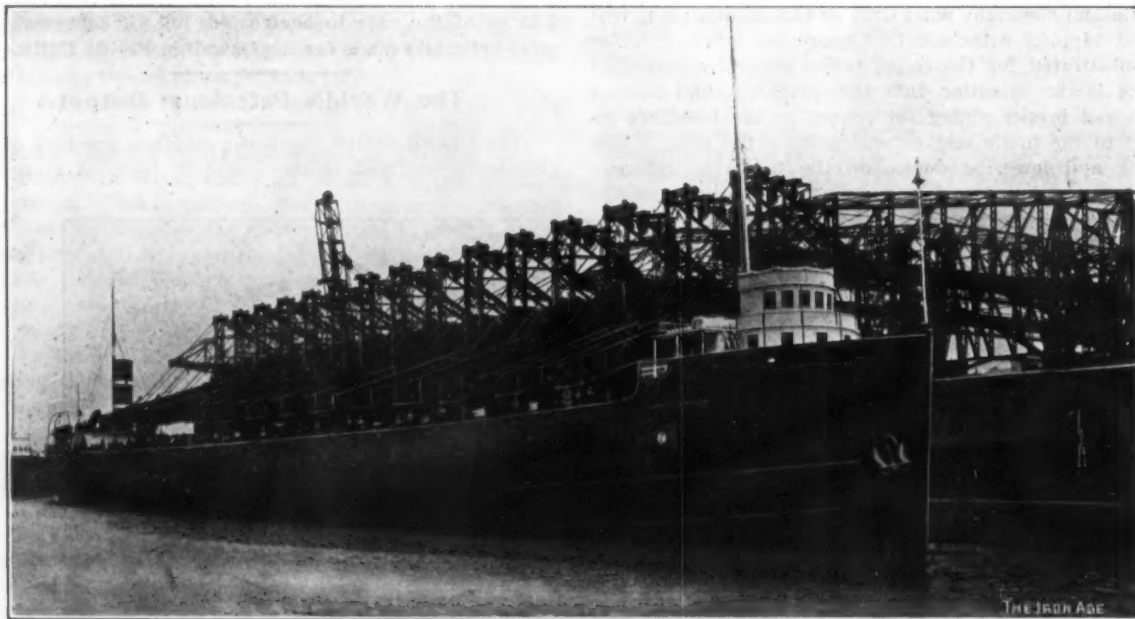


Fig. 1.—The Steamer Hoover and Mason at South Chicago.—Unloading Machinery of Hoover & Mason Type.

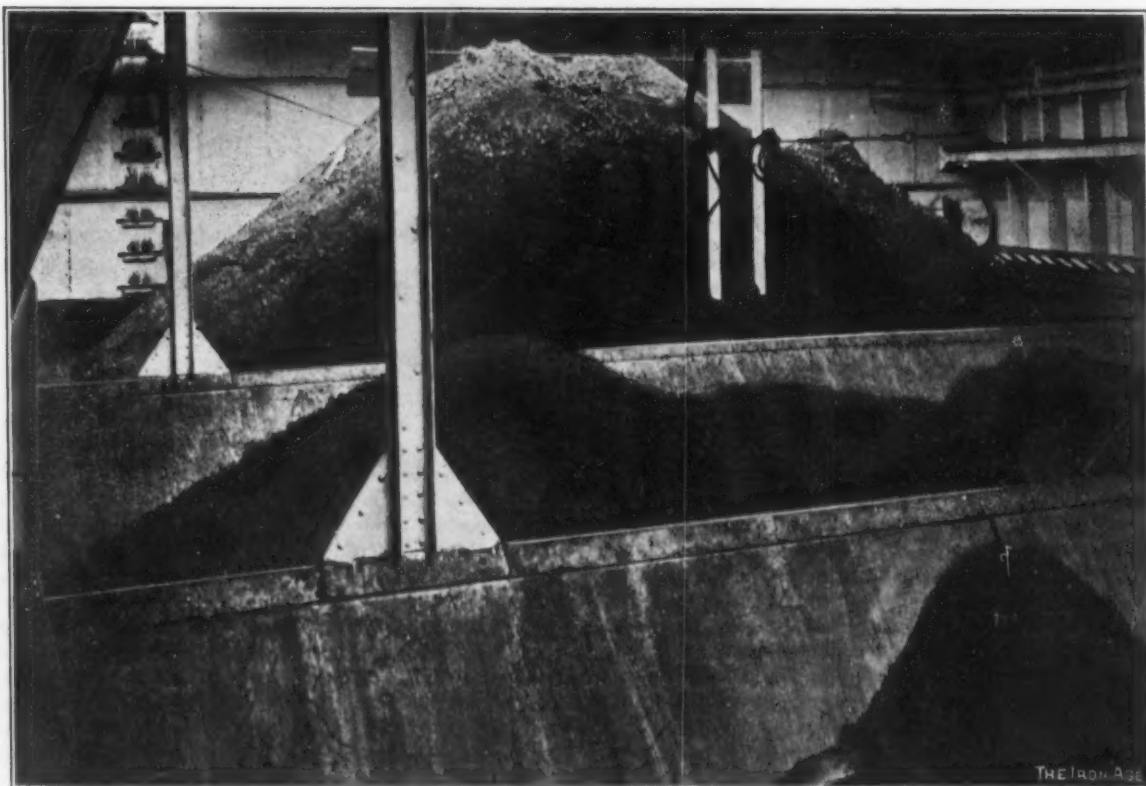


Fig. 2.—View in Hold of Vessel.—One Hopper Fully Loaded and Others Partly Loaded.

sulting engineers for whom the vessel is named and built for the Zenith Steamship Company, Duluth, by the Great Lakes Engineering Works, Detroit. In designing this boat four points were taken into consideration: 1. To construct a stronger boat without increasing the weight of the hull. 2. To have the entire cargo accessible immediately under the hatches to grab buckets. 3. To minimize the floor space to be cleaned up. 4. To bring up the center of gravity of the cargo as far as possible.

hatches 12 feet center to center. In the Hoover and Mason the hoppers are athwartship and 16 in number, extending from skin to skin of the ship, forming bulkheads or girders connecting the points of greatest strength, transferring the weight of the cargo from the bottom and frames and distributing it more evenly.

Construction and Arrangement of Hoppers.

The arrangement of the hoppers is another new feature and a radical departure from the latest type of

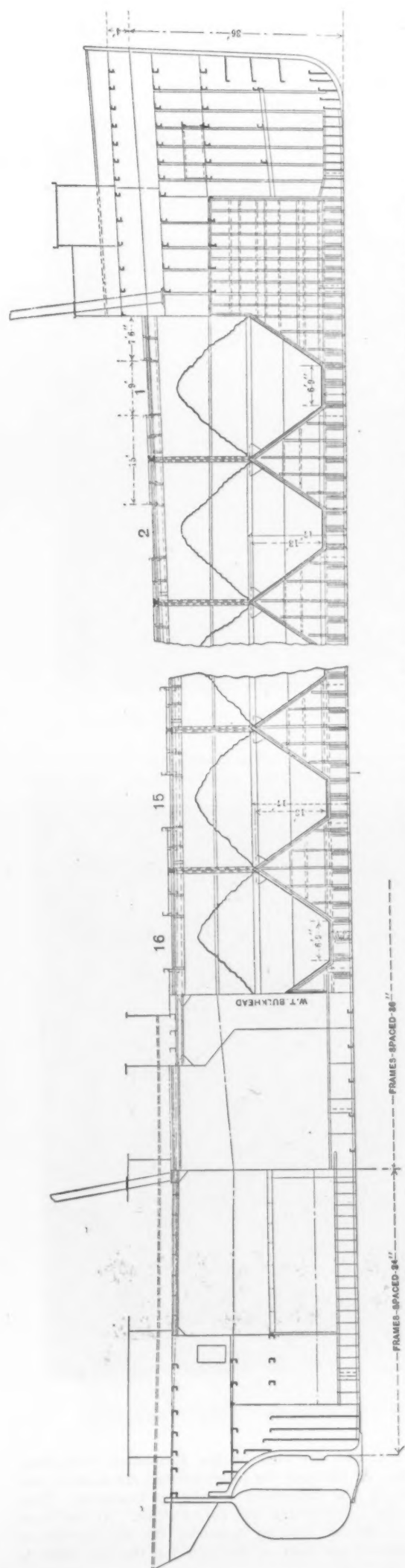


Fig. 3.—Longitudinal Vertical Section of Vessel.—Ten Intermediate Hoppers and Portions of Two Others Are Omitted in the Illustration Because of Limitations of Space.

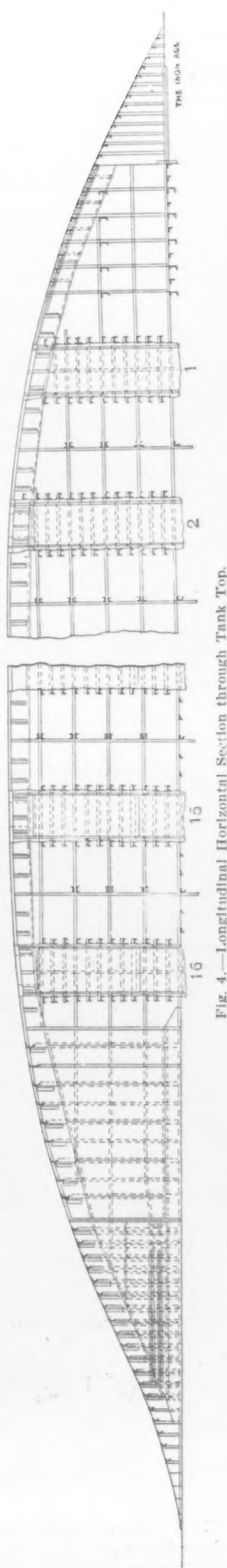


Fig. 4.—Longitudinal Horizontal Section through Tank Top.

construction. It permits a return to the standard hatch covers, it being not necessary as in the 12-foot centered boats to use the patent coverings. The 16 hatches, aside from the bunker hatch, are to be compared with 32 in the later ships. The arch construction of deck support has also been replaced by deck beams. While the Hoover and Mason was in commission but a portion of the lake navigation season, having only been launched on May 6, 1905, ample opportunity was given for establishing the claims of her designers, and while her rated capacity is only 9000 tons, she carried on her record trip 9841 tons. The labor cost of unloading this cargo was \$70, or about 7 mills per ton, the lowest unloading cost yet attained.

The Hoover and Mason is 524 feet over all, 504-foot keel, 54-foot beam and 30-foot molded depth. The power equipment consists of a quadruple expansion engine with cylinder diameters 18, 27, 40 and 42 x 62 inch stroke, and Niclausse water tube boilers 9 x 13 feet, 250 pounds pressure, with induced draft and chain grates. The hoppers are 24 feet wide at the top and 6 feet 9 inches at the bottom and have a height of 13 feet. The center of each is directly underneath the center of the hatch opening. The hoppers are built of steel plates, the bottom plates being $\frac{5}{8}$ inch in thickness to withstand the drop of the ore in loading, and bent up at the sides, greatly adding to the strength of the general construction. The width of the flat portion of the hopper bottom was governed by the size of the largest grabs at the unloading docks at lower lake ports. The incline of the sides of the hoppers is such as to trim the cargo to the center of each hopper and make it easily accessible to the operation of the grab buckets. False plates from the shell of the ship run in-board between transverse hopper sides, completing the hopper. The ore is thus trimmed by gravity, no shovellers being required to clean up the cargo.

Fig. 1 shows the Hoover and Mason under the unloading machines at South Chicago. Figs. 2 and 3 show a plan view and longitudinal and transverse sections. The interior of the vessel is seen in Fig. 4, showing the general hopper arrangement and the deck beam supports, which rest on the hopper tank top. Fig. 5 is an interior

view of the ship, showing one of the hoppers fully loaded and two others partly unloaded. This view, as well as Fig. 6, clearly shows the fall of the ore from the hopper sides. The general construction of the hopper is shown in Fig. 7.

No Hand Shoveling Required.

One of the points made against the practicability of the transverse hopper construction was that the ore would

as shown in Fig. 2, the large pieces falling by gravity to the outside circumference of the cone and resting against the hopper sides, while the fine ore settles in the center. As the ore is unloaded these lumps slide down the inclined sides, carrying the fine ore with them.

The first experiments carried on by Hoover and Mason with transverse hopper construction were made in the steamer Mataafa, which was sunk recently and which

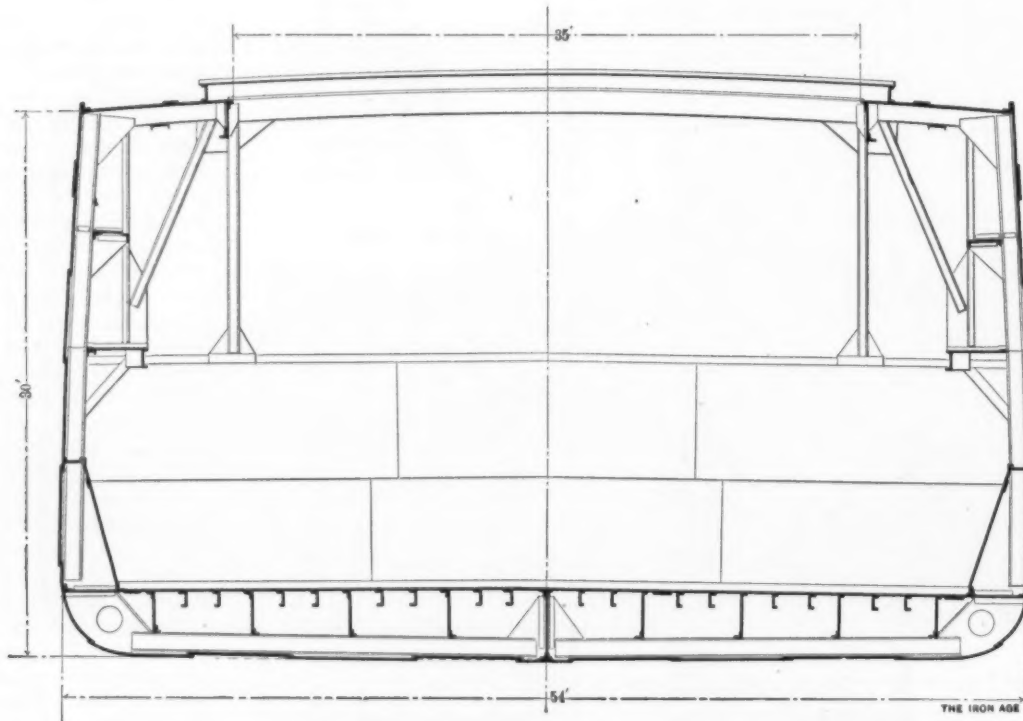


Fig. 5.—Beam Section through Hopper, Showing Steel Shapes and Method of Construction



Fig. 6.—Grab Bucket in Hopper.—The View Shows the Flow of Ore on the Slopes.

adhere to the plates forming the inclined sides and that the removal of this ore would necessitate the employment of shovels. This difficulty has been overcome in the manner of loading. The spout of the chute from the dock pockets, instead of being directed against the sides of the hopper, discharges over its center, forming a conical pile,

was owned and operated by the Pittsburgh Steamship Company. At the time the experiments were made it was operated by the Minnesota Steamship Company. This ship was of the ordinary lake construction. At that time it was recognized that by lessening the flat portion in the bottom of the boat on the tank top the ore could be

unloaded more quickly. A transverse hopper of timber construction was built inside the boat. It was found that this arrangement materially reduced the cost of handling the ore, but the installation of transverse hoppers on the

Hoppers Become the Tank Top of the Water Bottom

In the Hoover and Mason the hoppers form the tank top of the ship's water bottom, which is another departure from the more recent double hull construction on the

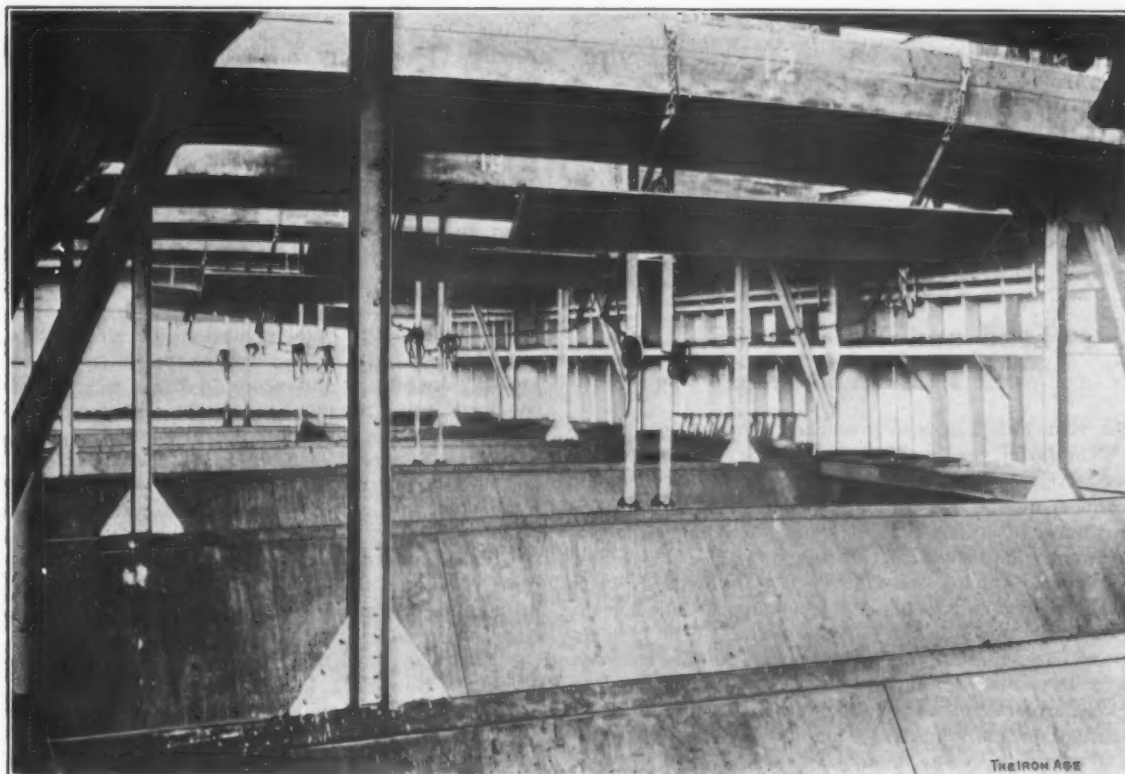


Fig. 7.—View of Hoppers After Ore Has Been Unloaded.

ship's tank top, it was also found, greatly added to the weight of the hull construction and consequently reduced the carrying capacity. It was then concluded that in or-

der to secure the economical employment of transverse hoppers the general design and construction of the ship would have to be materially changed.

Great Lakes. The deck is supported by beams resting on the ridges of the hoppers. These come midway between the hatches and extend the full width of the ship, but



Fig. 8.—Hopper Empty.

der to secure the economical employment of transverse hoppers the general design and construction of the ship would have to be materially changed.

from their location it will be seen that they do not interfere with the cargo in any way. Beams on either side of the hatches run continuously fore and aft of the ship,

forming an excellent local stiffening of the top chord of the truss formed by the sides of the ship. Deck beams and braces are clearly shown in the athwartship section, Fig. 3. The frames or ribs, instead of continuing unbroken into the water bottom, stop at the hopper tank top, to which they are attached, and continue again at a point inside the hopper. This design was necessary to secure an absolutely tight construction of the water tank and has not reduced the general strength of the ship's construction.

The designers are satisfied that in this style of construction they can secure a vessel of great strength, with a weight of hull fully as low per ton of freight carried as in any other form of construction. The ship's quarters are unusually well planned. The lookout on top of the pilot house is so far above the water line as to be often above the fog.

Lead and Tin in 1905.

BY E. A. CASWELL, NEW YORK.

The year 1905 has been a marked contrast to that of 1904. The latter year was marked by a steady, firm market for metals, without many sharp changes; but 1905 has been almost unique and certainly phenomenal in its magnificent burst of activity, the immense absorbing capacity of the country and the dizzy altitude of values which has been reached. During the wild speculation of the French syndicate in 1888 and 1889 and the contemporaneous corner in this country made by N. Corwith & Co., tin in London went to £170 per gross ton, while copper in this country went to 18 cents per pound and lead practically to 6 cents. Enormous stocks were being carried. The situation rested on individuals for support, and those individuals were staggering under a crushing load. Since that day and the subsequent crash, prices have not been raised but once anywhere near to those limits until this year, and now they are back again on the same high plateau; but the plateau, instead of being a platform on posts, rests on the solid earth base of an actual demand which has been greater than the supply, and it holds its level by inherent strength.

Causes of Present High Markets.

Three causes may be adduced for the present high markets. The first is that the organization of the so-called trusts, or bodies which practically control the trade, have acted as a balance wheel and a stimulus to trade. This does not seem to be a very satisfactory explanation, for the simple reason that fictitious influences in the long run never really affect supply and demand. The second and more natural cause may be found in the enormous crops, the heavy output of metals, the increasing population and the great prosperity of the country, unhindered by tariff changes or adverse legislation. A third cause, and one which is held to be a genuine factor of great weight, is the enormous influx of gold during the past few years into the treasure vaults and the circulation of the world. Briefly that means that the purchasing power of gold has diminished, or, in other words, that the dollar will buy less poundage of goods or that the same poundage commands more dollars. The advocates of this last theory are therefore inclined to believe that the present high prices have come to stay and that we may very justly expect to see either steady markets at these higher rates or even still higher ones if Alaska, South Africa and our Western States continue to pour a steadily increasing stream of the yellow metal into use. The entire other side of the question is represented by the very conservative and gray headed members, who shake their heads ominously and say that we have seen these situations before, that history repeats itself, that the higher prices go the farther they will have to fall, that when cats and dogs and everything can be sold we are very close to the crest, that one must sail with very much shortened canvas and that within two years every metal on the list will be purchasable at least 30 per cent. lower. In rebuttal of these somber views the statisticians claim that enough orders are booked in every line to carry the boom along very comfortably for six months to come, and that without a new order for half of next year the wheels of

the factories will all be buzzing without hindrance or stoppage. Evidently time alone can open out the verdict, which is at present a sealed one.

The Lead Market.

The lead market for 1905 may be said in racing parlance to have kept up a "fast pace with a break-neck finish." There has been at no time any surplus or the smallest opportunity for accumulating any. The figures of the country's consumption have not yet been made up, but it is safe to say that it has surpassed all records and will probably prove to be very close to 340,000 tons.

The year opened with the price of the American Smelting & Refining Company at 4.60 cents, New York. On January 23 it went off to 4.45 cents, on March 20 it went up to 4.50 cents, on July 26 to 4.60 cents, on August 24 to 4.85 cents, on November 1 to 5.15 cents, on November 16 to 5.25 cents, on December 4 to 5.35 cents and on December 21 to 5.60 cents.

Meanwhile the outside market has at no time been any cheaper, but, on the contrary, has been marked by a steadily increasing difference in favor of the soft Missouri and other outside brands. It was steadily so acute as to practically force an advance on the part of the American Smelting & Refining Company. Thus, at the end of October the New York price was 4.85 cents, but 5.15 cents was actually bid in the open market at St. Louis for almost any brand, quantity and delivery, and a few days later when New York was pegged up to 5.15 cents St. Louis immediately rushed up to a still higher price and continued to keep ahead of the procession steadily for several weeks, and early in December, when the American Smelting & Refining Company's price was 5.35 cents, New York, lead was actually sold at 5.75 cents, East St. Louis, or equal to 5.92½ cents at New York.

These contradictions appear to be extravagant and humorous, but, as a matter of fact, were no more grotesque than the method of selling adopted by the American Smelting & Refining Company during a large part of the last quarter of the year, which was to book orders for shipment at the convenience of the sellers, not sooner than four or five weeks off, and at a price which should be their own price current on the day of shipment. Thus sales which were made in early November on a 5.15-cent market were actually billed at 5.35 cents, which was the price current on the day of shipment. This latter method of selling is certainly very convenient for refiners, but for the manufacturers it is a condition which makes business almost impossible in some lines. Take, for example, the electrical business, in which manufacturers have to make contracts for delivery three, four and five months off. With any such floating value and unstable basis as that above mentioned they have but two alternatives: Either to gamble on the future price or to demand so high a figure for their manufactured goods as to cover any presumable advance. It is precisely this situation which has carried St. Louis at all times for the past three months anywhere from 15 to 30 points above the American Smelting & Refining Company's price, simply because the consumers were thereby assured of something firm against which they could operate safely. At the same time it must be confessed that the path of the refiners has by no means been an easy one. They could not book orders for shipment a month off on a flat price when the demand was overreaching the supply, and it was utterly impossible for them to keep up with orders. In addition, they have always claimed that this method went a long way toward killing speculation, and they have invariably bent their efforts to that end since the formation of the company. If there is any speculation to be done they feel themselves quite competent to do it. One absolutely new feature in the market cropped up during December, and that is the fact that several thousand tons of actual foreign lead have been bought on the other side and freight secured for its transportation to this country. There is but one deduction from this fact, which is that there is an absolute famine in lead in this country. Our entire domestic production has been absorbed. All the ore has been imported that the refiners could lay their hands on. All the free lead from imported bullion has been taken up and, finally, importation itself has taken place. Meanwhile, the foreign lead price has advanced steadily. Early in the year it

stood at £12 15s. per ton at London, and during March eased off to £12 5s, and from that month to the close of the year each month's average has been higher than the previous one until the climax in December, when it touched £17 8s. 9d. The situation there has been similar to our own. All the reserves have been called for and it has been at times difficult to secure supplies as fast as needed.

Securities of Smelting Companies.

While the above named marked changes were occurring in the actual metal the changes on the security map were no less. Early in February the scheme of the American Smelters Securities Company was announced and that was followed early in April by its incorporation. About the same time the Pacific coast lead smelters were consolidated. A little later officers of the American Smelters Security Company were elected. In May announcement was made of the absorption of the above named merger, which took in all the Pacific coast smelters, and the new company made a long contract with the Bunker Hill and Sullivan mines to run over a number of years. In September the Securities Company took in the Federal Mining & Smelting Company, so that the year closes with the powers of the American Smelting & Refining Company practically in control of the lead business of the country, barring the St. Joseph Lead Company and the Balbach Works. The St. Joseph Company has followed out its traditional lines of quiet and unassertive but decided independence, and it has increased its refining capacity during the year probably 40 per cent., making it one of the very large producers of the country.

Another of the stock features has been the wonderful advance in the price of the American Smelting and the National Lead Company stocks. The former started from \$79 for the common early in the year and went up as high as \$165, and from \$111 up to \$136 for the preferred, while National Lead common went from \$24 to \$89 and the preferred from \$97 to \$111. Naturally there have been endless queries and surmises regarding these phenomenal variations. The long talked of merger between the National Lead Company and the United Lead Company has been holding the middle of the stage and playing a very prominent part throughout the year, and so far as the outsider could observe it has been a case of hot and cold, on and off, a union and a break, in succession, and the public has known very little about the actual inside situation. Naturally enough this combination and the advance in the National Lead common have been linked together as having a very close connection. Dame Rumor says that the American Smelting & Refining Company powers bought a large majority of the National common on the way from \$20 to \$30, and that from then on the dear public has kindly gone short of the stock and has sold the entire issue over about five times, feeling at each 10 points higher that it was impossible for it to go any higher and that further short selling was quite safe. It is possible that the annual meeting occurring shortly may clear up some of the mystery. Insiders in both concerns say positively that the combination is an accomplished fact, and will soon be made public with all details.

This chronicle will, perhaps, not be complete without a reference to the death of E. W. Nash, which occurred July 29. He had been connected with the lead business all his life and was known throughout the trade as a man of rare geniality of disposition and equable temperament, kindly in thought and speech, of a broad and charitable nature, and at the same time far-sighted and able, an exceptional combination of a courteous gentleman and a keen business man, with high ideals of just dealing and a right purpose.

The Tin Market.

The tin market of the world over 1905 has shared in the remarkable advance which took place in every metal. The year opened with the New York price close to 29 cents per pound, but during the month it ran up to 30 cents, then declined again over February, and along early in March touched 28.65 cents, but rolled up rapidly to

29½ cents by the tenth of the month, then to 29.75 cents by the middle and to 30¼ cents at the close. During April there was a bulge to 31.25 cents, but another recession followed to 30 cents. During May the fluctuations were all within the half cent comprised between 30 and 30.50 cents. Early in July a very smart advance set in and prices were carried up steadily until they reached 33½ cents by the end of August. A recession then took place which carried the price to 31.75 cents by the middle of September, when another advance set in more vigorous than any of them and carried the price to 36½ cents by the middle of December.

The London tin prices over 1905 were as follows:

Highest.		Lowest.		Highest.		Lowest.	
£ s.		£ s. d.		£ s. d.		£ s.	
Jan.	133	129	17 6	July	150 15	138	15
Feb.	132 10	129	17 6	Aug.	152 15	148	10
March	138 10	130	5	Sept.	148 12 6	144	15
April	145	138	10	Oct.	150	145	10
May	138 10	135		Nov.	157	148	10
June	140	136	2 6	Dec.	165 12 6	157	5

The American consumption for the year 1905 is estimated to have been very close to 40,000 gross tons, as against 36,000 tons in 1904. While this is an increase of 10 per cent., such a gain is a normal increase from year to year and is hardly sufficient to account for the present immensely high level. Most of the advances were made by actual consumption, which overtook production, although it must be admitted that when the price reached 34½ to 35 cents outside speculation stepped in at London and went a long way toward scoring the last £5 of the advance. Just at the moment when trade in this country was expected to fall off, as it ordinarily does early in November, there seemed to be a new and unusual spurt in the demand, and at the close of the year it was very confidently stated that enough orders were booked for the first three months of 1906 to warrant a full average consumption of tin.

It is somewhat difficult to understand clearly the phenomenal advance in tin during the last three months except on the principle that margins of difference of supply and demand are always very small compared to the totals. Thus the deliveries from London and Holland over all 1904 were about 39,000 tons and during the first eleven months of 1905 were close to 36,000 tons and will probably reach 40,000 tons for the year. It is apparent that up to date there has been enough tin to satisfy consumption, the visible supply on December 1, 1905, having been only about 1200 tons less than on December 1, 1904. The only conclusion we can draw is that a few hundred tons, probably less than 2000 tons, of demand over the supply has caused the entire hardening in value since November 1. It is therefore easy to see that an equal change, but downward, might readily come during the next 60 days. When the outside speculator enters the field in any staple article it is safe to assume that prices are not far from the top.

It was pointed out in this review last year that the increase of production had not been commensurate with the advancing consumption and that it was easily possible that a higher range of values might come to stay permanently. This probability has been confirmed by the trend and evidence in 1905, and taken in combination with the factor of the lower purchasing power of gold may readily cause the new state of affairs to become chronic. In addition we have ever present the fact that there has been no substitute whatever found for tin, nor during the year have there been any large new sources of supply found.

Osmon, a new kind of combustible, is being manufactured from peat by a company formed for the purpose at Bern, Switzerland. It is dried under the influence of the electric current and then further treated, so that under the action of electric osmose a new compound is formed. Recent tests indicate that it burns as well as coal, without giving off odor or smoke. The percentage of ash is said to be very small and no trace of sulphur is found in the fuel. It is said to be free from all corrosive influences on the boilers and furnaces in which it is burned.

The Foundry on a Chemical Basis,

BY REGINALD MEEKS.

It is not the purpose of this article to enter into a discussion pro and con on the subject of the advisability of adopting chemical methods in mixing iron for foundry use. That all the large foundries have in their employ a chemist or chemists of ability is well known. There are hundreds of smaller foundrymen who have a business too small to warrant so large an item of expenditure as a laboratory, yet who depend upon chemical analysis to mix iron intelligently for their castings. A third class would gladly avail themselves of a chemist's services were they familiar with the use of the reports received from him. There is still a fourth class who could not be induced to adopt modern methods under any consideration until a large loss occurs and then they hasten to call "the doctor." Of this last class nothing will be said, but it is for the foundry superintendents or foremen who care to learn and improve that the chemist offers his aid and co-operation.

How to Use a Chemist to Advantage.

Many men in charge of a foundry express themselves as being heartily in favor of chemical analysis, but say that never having had any experience themselves they cannot make use of the report received from the chemist.

Unfortunately the majority of iron and steel chemists are either not practically experienced in foundry practice or else are negligent about offering a helping hand to their clients, to explain their requirements and teach them how to use chemical values when making their mixtures. If this were not so such a complaint would not be so frequently made.

Let us assume that the superintendent has determined to have his pig iron, coke and a certain number of heats per week analyzed by a public chemist. The first thing to do is to consult a reliable chemist who thoroughly understands the market situation and who will be competent to advise upon the proper brands of iron to buy and then contract for analytical work either according to the number of analyses or else for unlimited service based upon a definite tonnage capacity of the plant. The latter is a favorite method and one that has many advantages.

A consultation will result in sound advice and either a more suitable kind of iron may be purchased or the buyer will be satisfied that he is already purchasing iron suitable for his purposes. He should then contract with

point much misunderstanding arises between buyer and seller.

It should be understood and so stated in the contract that manganese and phosphorus should lie between certain defined limits and that the price should depend upon the percentage of silicon and sulphur contained in the iron. Specifications for ordinary foundry iron may be cited as an example, but of course the chemist should suggest a set suitable to the needs of his clients. Almost all iron manufacturers are willing to sell on guaranteed analysis, because the necessity of grading by fracture is done away with and this item is figured at perhaps 15 cents per ton.

Specifications for Ordinary Foundry Iron.

The following is taken from the *Transactions American Institute of Mining Engineers*, vol. xxxv., page 182:

In the absence of specifications the current grades of pig iron should be considered as representing the following chemical composition:

Grade.	Silicon. Per cent.	Sulphur. Per cent.
Scotch.....	Over 3.00	Not over 0.030
No. 1.....	2.50 to 3.00	Not over 0.030
No. 2 X.....	2.00 to 2.50	Not over 0.045
No. 2.....	1.75 to 2.25	Not over 0.055
No. 3.....	1.50 and over	Not over 0.075

The modified report omits the grades known as Scotch and No. 2 X and substitutes the following classification:

Grade.	Silicon. Per cent.	Sulphur. Per cent.
No. 1.....	2.75	0.035
No. 2.....	2.25	0.045
No. 3.....	1.75	0.055
No. 4.....	1.25	0.065

with a permissible variation of 0.01 per cent. of sulphur and 10 per cent. of the quantity of silicon.

The numbers 1, 2, 3, &c., must not be confused with the grade numbers of fracture classification, but are simply a convenient means of designation for the different percentages of silicon. This is so specified here because a carload of pig iron analyzing 2.80 per cent. in silicon would not necessarily show a fracture similar to the old style No. 1 foundry. Conversely a fracture graded No. 1 may not analyze 2.50 to 3 per cent. in silicon.

Now that the question of proper iron and the contract for it are disposed of the superintendent is ready to start work. A system for conveniently disposing of various carloads of iron and keeping a compact record of their location in the yard may be here suggested. The arrangement in the yard must of course be left to his own good judgment, but the office record may be greatly enhanced by the use of cards similar to the following:

PILE NO. 4	
CAR NUMBER	DATE RECEIVED
GROSS W'G'T TARE	BEGAN USING
NET W'G'T.	FINISHED USING
SAMPLE SENT TO CHEMIST REPORT RECEIVED	CHEMISTS REPORT.
KIND OF IRON	SILICON
CLASS	MANGANESE
LOCATION IN YARD	COMB. CARBON
	GRAPH. CARBON
	PHOSPHORUS
COST PER TON	SULPHUR
COST PER LB.	

Fig. 1.

his brokers demanding strict adherence to specifications laid down by the chemist. But the buyer should not expect the furnace company to supply iron meeting both chemical and fracture specifications and on this very

When a car is received in the yard a sample of iron is taken before unloading in a manner to be described later and the iron is then piled compactly in a vacant space, numbered or lettered in any convenient permanent

manner and kept separate from all other carloads. A record is then made on the card showing the car number, gross weight, tare, net weight, date received, kind of iron, class, location, &c. A sample is then taken and unloading proceeds.

Sampling.

The results obtained by the most skilful chemist will be of no practical value and may be even a detriment unless the sample on which he works represents a fair average value of the carload. Hence it is of the utmost importance to see that the sample is always taken under the same conditions and if possible by the same man, who should be trustworthy and reliable.

A method of sampling a carload of pig iron which has proved satisfactory will be here suggested. However, chemists differ in a few details and the method suggested by the man to be employed should be followed.

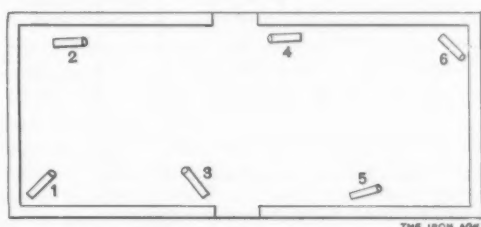


Fig. 2.

The writer believes that a sample consisting of six pigs will be accurate enough and will answer all requirements. There can be no objection to taking a 12-pig sample except the increased labor and inconvenience involved. The points from which the six pigs are taken are indicated in Fig. 2, but the positions need not be any definite distances apart. The general idea of dividing the car into six localities and then zig-zagging through the load, taking one pig at a time, will give uniform results. The sampler must not pick small pigs only so as to save labor of breaking.

When the sample has been selected each pig must be broken and one-half of each rejected; the remaining six halves are then taken to the machine shop or to a drill press and borings taken from each piece, approximately from the center of the fresh fracture, the pig being held on end. Drilling should never be done into the pig from the side.

Any convenient size of drill may be used, but care must be taken to keep the drillings free from sand, dirt, scale and oil, because the presence of these may make the analyses worthless. An equal amount of drillings from each pig should be taken and the entire amount need not be more than about one full ounce when mixed. This sample is then marked with car number and brand and sent by mail to the chemist. It frequently happens that a foundry will send as much as a pound of borings by express, which is not only an unnecessary expense but is also extra labor, time and trouble. One ounce is plenty for analytical requirements.

A sample of coke is taken from all over the top of the carload; 30 or 35 pieces, large and small, being selected with reference to the appearance of the whole lot. A piece the size of a pea is broken from each lump and these may or may not be crushed before sending by mail.

Chemist's Report.

The report from the chemist will contain information similar to the following, which should be added to the card in the proper place:

PIG IRON.		COKE.	
	Per cent.		Per cent.
Silicon	2.60	Sulphur.....	.90
Manganese .....	.35	Ash.....	9.10
Graphitic carbon .....	...	
Combined carbon .....	...	
Phosphorus .....	.650		
Sulphur .....	.030		

A contract should be made for coke with respect to sulphur and ash, and this should be lived up to.

We are now ready to utilize the values of the various impurities in mixing iron. In determining what our iron should analyze it is a good rule if experience is

lacking to send sample borings from perfect castings of the desired kind and use the results as a guide. We decide this way or by experience that a casting analyzing as follows will be satisfactory and we will be satisfied to duplicate it:

	Per cent.
Silicon	1.85
Manganese .....	.70
Phosphorus .....	.520
Sulphur .....	.120

Suppose we have at our disposal six cars of pig iron, cast machinery scrap, stove plate, &c. We desire a good product and do not care to use too much scrap; 40 per cent. seems good economical practice we decide in this case, but of course conditions govern the amount to be used.

Figuring the Mixture.

We will assume that the cards show six cars of pig iron, with analyses, and besides there are the two kinds of scrap:

	Pig Iron, per cent.						Scrap, per ct.	
	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	Mchy.	Stove.
Silicon.....	2.60	2.26	1.85	2.00	1.45	2.75	2.00	2.00
Manganese...	0.35	0.65	0.70	0.62	0.74	0.40	0.30	0.30
Phosphorus...	0.650	0.450	0.340	0.310	0.160	0.560	0.600	0.850
Sulphur.....	0.030	0.033	0.040	0.038	0.045	0.029	0.130	0.130

The gross percentage of any element is found by multiplying the percentage of that element in a given kind of material by the number of pounds per charge, adding the pounds so obtained of that element together and dividing by the total number of pounds in the charge.

One of the most common sources of error is the misunderstanding arising over decimals. It should be borne in mind that 2.60 per cent. is exactly the same as 0.0260 and 0.65 per cent. is the same as 0.0065. The per cent. mark is used for convenience, and is equivalent to moving the decimal point two places to the left and corresponds to two zeros.

To find the pounds of any element per charge we multiply the percentage by the number of pounds, as already mentioned. For example, let us take pig iron containing 2.60 per cent. silicon and assume that we are using 300 pounds per charge:

$$0.0260 \times 300 = 7.8000 \text{ pounds silicon.}$$

In the same manner we find manganese:

$$0.35 \text{ per cent, or } 0.0035 \times 300 = 1.05 \text{ pounds manganese.}$$

If this rule is kept in mind and the decimal places are properly pointed off no mistakes should arise from this source.

A complete mixture will now be given which fulfills the requirements as set down earlier. It is better to have a printed form on which to keep a record of all mixtures, and the following has proved satisfactory.

It will be seen that the net results closely approximate the values which we set out to obtain. These can only be arrived at after a series of trials and corrections, but after the principles have been thoroughly mastered it will be found to be very simple to adjust the weights so as to obtain the proper values. Silicon is the basis of calculation, manganese (if in deficit) is supplied by the use of 80 per cent. ferromanganese, while phosphorus and sulphur can be regulated only by the judicious use of iron containing the proper amounts of these elements.

The writer's plan is to work backward when figuring a mixture. Starting with the net results the gross values are obtained by dividing the net values by the loss by oxidation, as follows: Since the loss is assumed in this case to be 15 per cent., it stands that the net results must be 85 per cent. of the gross, and it must also be true that the net value divided by 85 per cent. will give the gross—e. g., 0.85 divided into 0.018400 equals 0.0217, or 2.17 per cent. gross silicon. Since the total pounds of silicon in the mixture divided by the total pounds of iron in the charge gives the gross silicon, conversely the gross percentage multiplied by the total weight must give the pounds of silicon in the mixture, as follows:

$$0.0217 \times 3,016 = 65.55 \text{ pounds silicon.}$$

To supply this amount to the mixture we have pig iron, two kinds of scrap and ferrosilicon if necessary.

It was decided to use 40 per cent. of scrap, and this should consist of about two parts machinery to one part

substituted. It should be remembered that silicon generally exists (in foundry iron) in full per cent. and fractions thereof, manganese in hundredths of 1 per cent. and phosphorus and sulphur in thousandths of 1 per cent. Hence too much hair splitting over results which do not come out exactly as calculated should be avoided. It is only necessary to play safe in figuring the last named elements.

The analysis of scrap is impracticable on account of the exceedingly wide variation in makers of the original product, the different kinds of machinery, &c. Car wheels, brake shoes, wrought iron or steel scrap must be sorted out and never be used except when the mixture is sufficiently high in silicon to be able to carry this hard material or when a mixture lower in this element is desired.

Return scrap, such as gates, sprues, bad castings, sweepings, &c., may be assigned a fairly accurate value by using the figures supplied by the chemist from samples taken from heats either every day or two or three times a week. This material should always be used up as fast as made, and it is better practice to use a definite amount per charge than to use it heavily on a few charges to the exclusion of other scrap.

The mixture shown above is supposed to have been the first one before return scrap has been made. The mixture following this one will naturally contain this class of scrap, and a rough estimate of the weight on hand will give an idea about how much to use on each charge and at the same time use up all the material. If it is convenient to store one day's making of return scrap it would be better to use a constant weight per charge, and the storage bin each day may be replenished.

Physical Tests.

It is comparatively easy, and not very expensive, to conduct a physical test upon bars made especially for the purpose. There are a number of good, inexpensive breaking machines on the market, costing less than \$100 and having a capacity of 5000 pounds transverse stress. Three bars should be cast, one each from the first, middle and last part of each heat. The bars should be 1 x 1 x 13½ inches in size, and should be poured from good, hot, clean iron. Care should be taken to have the bars of exactly the same size from day to day, so as to have the results comparative. They must never be tumbled. The reason for this is because submitting a casting to repeated shock, such as would be done by tumbling, has a tendency to strengthen rather than weaken, although the latter would naturally be expected. For information relative to this statement see article by A. E. Outerbridge, Jr., entitled "The Mobility of Molecules of Cast Iron," *Transactions American Institute of Mechanical Engineers*, volume XXXV, page 223, or the *Journal of the Franklin Institute* for July, 1898.

In volume XXXV, page 174, of the *Transactions American Institute Mechanical Engineers*, is shown the "Arbitration Test Bar" and the mold for making it. This has been suggested, after much thought, by a committee of competent and experienced engineers and should certainly be carefully considered by the foundryman. If not adopted then the bar previously mentioned should be used. A convenient way to cast the latter is to use a mold having a riser 2 inches square and 3 inches long, which may be broken from the bar and used to furnish the sample borings to be analyzed by the chemist. Both the bar and the riser must be marked with the same number, and each bar must be distinguished from the others. The borings from the bars may be mixed at the foundry or by the chemist, or if limited service has been agreed upon all the samples should be analyzed. This, of course, gives better results, but naturally costs more.

Carbon.

Carbon has been purposely omitted from the discussion because its direct effect is practically dependent upon the amounts and proportions of the other four elements and upon heat conditions. Carbon has the property, shared by none of the other metalloids of iron, of existing in several states and proportions, according to conditions. There are three principal allotropic forms of

carbon, graphitic, combined and tempered; the last named form will not be discussed because it is associated with that class known as malleable iron.

Graphitic carbon exists in the free state and is soft, black and flaky; these flakes divide the iron into innumerable planes and hence weaken the iron. On the other hand, carbon which is chemically combined with the iron imparts a great hardness, a white color and strength accompanied by brittleness.

There is a maximum point above which it is disadvantageous to have combined carbon, and this point depends upon the kind of castings to be made. All the carbon exists in molten iron in the combined state, but upon the iron solidifying it begins to separate out as graphitic carbon, and the amount so separated depends upon the percentages of silicon, manganese and sulphur present and upon the rate of cooling of the iron.

Increasing silicon and manganese, decreasing sulphur and prolonging the rate of cooling tend to increase the graphitic carbon, thus making soft castings. The converse is also true, and upon these principles a good or a bad casting is produced. The writer does not consider that it is absolutely necessary to analyze for carbons in pig iron, except occasionally, to be sure that the total carbon is above 3.50 per cent. However, all bars, test pieces, castings and the like should have both kinds of carbon determined.

If the superintendent takes care to see that the work is systematized and at all times furnishes whatever information the chemist may need, the two should have no trouble in producing a uniform grade of castings composed of the best iron for the purpose, and this department should run along without any friction.

It is of more importance to the foundry superintendent to know the chemical composition of every carload of iron he uses than to lay great stress upon the fact that the contract has been violated by a few points in percentage. If a generous allowance was made there should be little trouble in this respect.

Properties of the Metalloids.

In closing it might be advantageous to briefly outline the properties and effects of the various impurities found in cast iron. This may be shown at a glance by the following table:

By increasing these elements.	It will make the iron					Sluggish.	Brittle.
	Soft.	Hard.	Tough or strong.	Weak.	Fluid.		
Silicon	x†	..	..	x	x	..	..
Manganese	x†	x	..	..	..	..	..
Combined carbon...	x	x	x†	..	..	..	..
Graphitic carbon...	..	..	..	x	x	..	..
Phosphorus .....	..	..	..	x	x	..	..
Sulphur	x	..	..	x	..	x	x
Slow cooling.....	..	x	..	..	..	..	..
Rapid cooling.....	x	..	x	..	..	..	x

† When in great excess.

The foregoing should furnish the average foundry superintendent with enough data and information to enable him to adopt chemical methods and work in harmony with a chemist, thereby increasing his own efficiency and the quality of his product.

Later Reports of Electric Smelting at Portland, Ore.—A synopsis of the preliminary report of Dr. David T. Day of the United States Geological Survey, on the electric smelting of magnetic iron ores in the form of black sands, was printed in *The Iron Age* of December 28, 1905. Later reports received by Dr. Day, from the operations of the electric furnace at Portland, Ore., show that the last eight runs (up to December 5) of the smelter there yielded an average of 53 per cent. metallic iron from the magnetite used. Where the magnetite was specially cleaned 65 per cent. metallic iron was attained in one instance. The average of these eight runs was 14 pounds of steel per horse-power day, which compares very favorably with the report of results attained in Germany, as given in Dr. Eugene Haanel's report as chairman of the Canadian commission that made investigations in Europe in 1904.

The Shaw Electric Ladle Crane.

In a modern open hearth furnace plant one of the most important parts in the equipment for handling material is the ladle crane. Such a crane in order to successfully perform all of the work required of it in the casting pit and on the floor must have two independent

three additional plants were equipped with cranes of the same type. Since then large numbers of such cranes have been turned out by the same company, four having been installed this year, each of which has a main trolley of 75 tons capacity and an auxiliary trolley of 25 tons capacity. These were furnished, two to the Nova Scotia Steel & Iron Company, Limited, Sydney Mines, Nova Scotia;

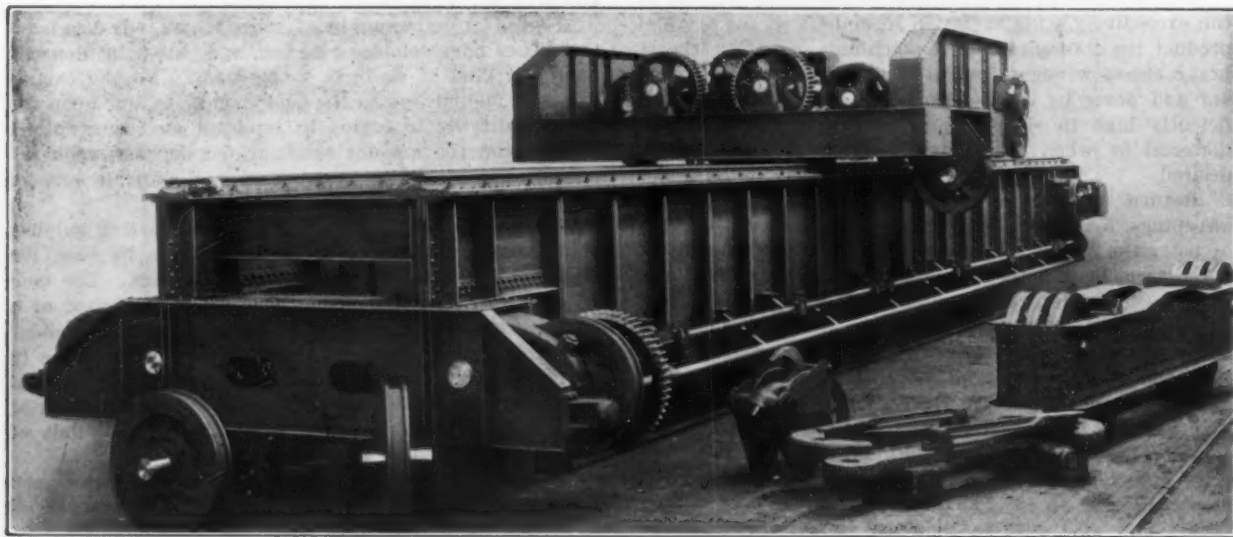


Fig. 1.—The Shaw Electric Ladle Crane for the Nova Scotia Steel & Iron Company as It Appeared Just Before Shipping.

hoists, either of which at any time can be at any point on the bridge regardless of the position of the other. This requirement is satisfactorily met by only one type of crane. This type has the main or ladle hoisting agencies, whether chains, wire, rope or screws, so carried by the trolley that one overhangs each side of the bridge of the crane and by means of two separate lower blocks or hangers or a lifting beam is attached directly to the

one to the Dominion Iron & Steel Company, Limited, Sydney, Nova Scotia, and one to the Latrobe Steel Company, Latrobe, Pa. Aside from differences in span and in certain minor details the four cranes referred to resemble the one illustrated, which is one of those installed for the Nova Scotia Steel & Iron Company.

Fig. 1 shows the crane on the floor of the shop before it was shipped, all of the parts being shown though not

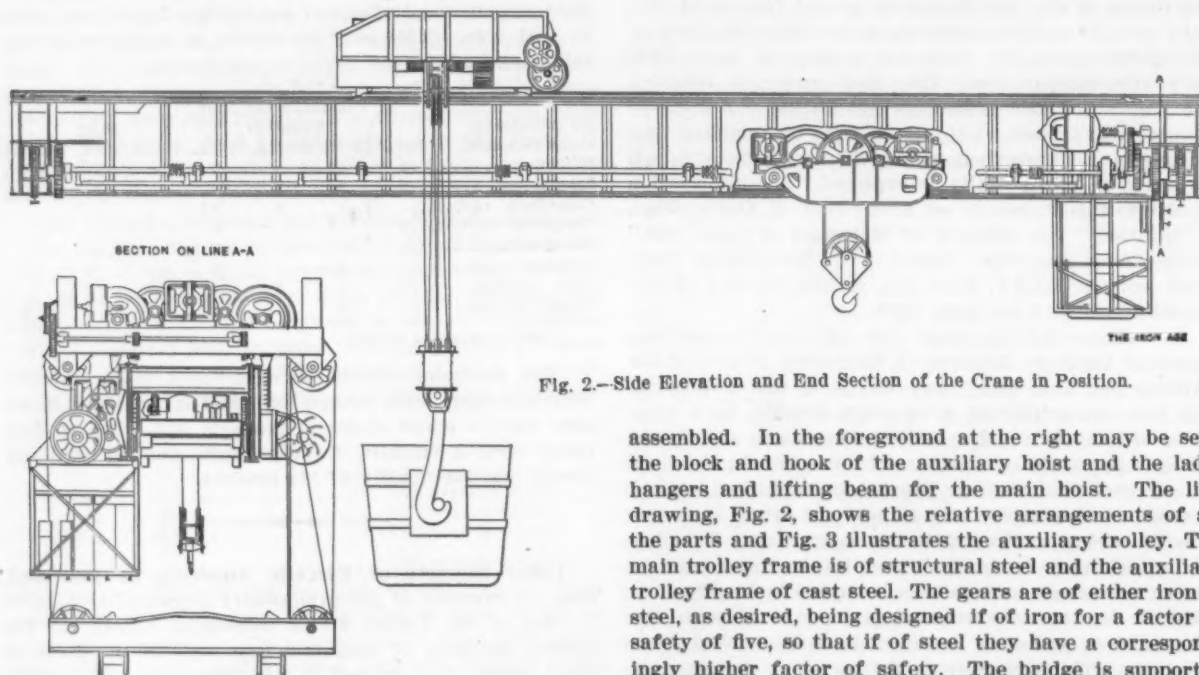


Fig. 2.—Side Elevation and End Section of the Crane in Position.

ladle trunnions. This arrangement permits an auxiliary trolley provided with a hoist of less capacity to run between the girders on their lower flanges and to travel the entire length of the bridge without being in any way affected by the position of the main trolley. The purpose of this auxiliary trolley is to set the ingot molds, handle and load the ingots, tip the ladle, &c., and it must be provided with high speed hoisting and trolley traversing movement.

Early in the year 1895 the first crane of the above description was installed by the Shaw Electric Crane Company, Muskegon, Mich., and during the same year

assembled. In the foreground at the right may be seen the block and hook of the auxiliary hoist and the ladle hangers and lifting beam for the main hoist. The line drawing, Fig. 2, shows the relative arrangements of all the parts and Fig. 3 illustrates the auxiliary trolley. The main trolley frame is of structural steel and the auxiliary trolley frame of cast steel. The gears are of either iron or steel, as desired, being designed if of iron for a factor of safety of five, so that if of steel they have a correspondingly higher factor of safety. The bridge is supported by four equalizers, each of which carries two wheels.

The crane is equipped with five motors with an aggregate capacity of 266 horse-power. An 80 horse-power motor operates the main hoist, a 27 horse-power motor the main trolley, one of 66 horse-power operates the bridge travel, one of the same size is used on the auxiliary hoist, and a 27 horse-power motor is used to travel the auxiliary trolley. The main hoist is effected by 12 parts of $1\frac{1}{2}$ -inch special steel rope, six on each side of the crane. The auxiliary hoist uses four parts of 1-inch special steel rope. The span of the crane is 66 feet 10 inches, the main hoist is 25 feet and the auxiliary hoist 30 feet. Without load the main hoisting speed is 25 feet

per minute, the trolley travel 80 feet per minute and the bridge travel 200 feet per minute. With a 75-ton load the main hoisting, the main trolley traveling and the bridge traveling speeds are, respectively, 10, 60 and 150 feet per minute. The auxiliary hoisting speed without load is 45 feet and the auxiliary traveling speed 125 feet per minute. With a 25-ton load these speeds become 18 and 100 feet per minute, respectively.

Both hooks are provided with limit switches to prevent overtravel of the hooks. The limit switches are located in the operator's cage and are released by solenoids, energized by an electric current, the circuit of which is closed by a traveling contact geared to the hoisting train. Each hoist is provided with both electric and load brake. The electric brake comprises a brake wheel surrounded by a steel band, to which are secured friction blocks. The strap is applied by the weight of the solenoid cores acting through toggle joints. The arrangement is such that the brake acts with the same force regardless of the direction in which it is revolving, and therefore brings the armature to a stop whether running in the hoisting or lowering direction. The brake is fitted with a retarding device consisting of an air cylinder and piston

loading the tire. Other views showed the bad effects produced by low bodies and by transverse obstructions carried low down, such as tow tool boxes, which were sometimes fixed to the back of a car. The author appeared to incline to the view that by suitable design not only new cars might be rendered practically dustless, but that old ones, by the employment of suitable shrouds and shields, could be rendered much more innocuous as dust creators than they are. No definite opinion on this point, however, was hazarded.

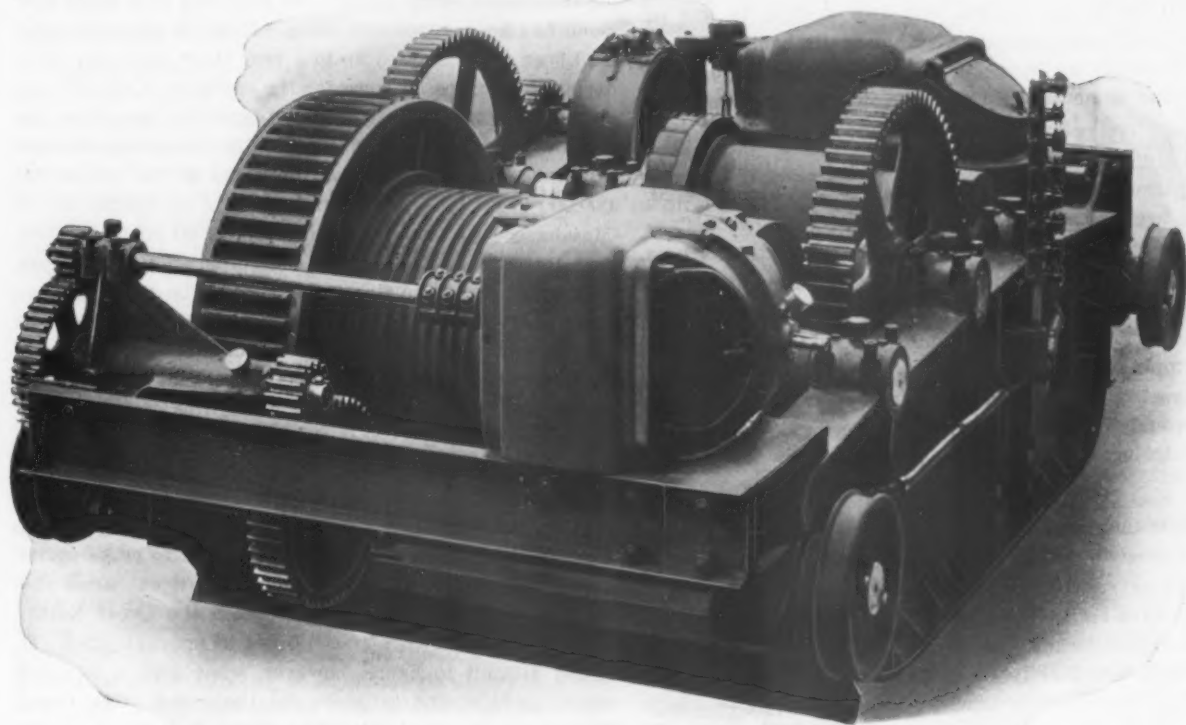


Fig. 3.—The Auxiliary Trolley Removed from Its Runways.

to prevent its too sudden application, which might cause shock or jar. The weight of the crane is approximately 110 tons.

Dust and Motor Car Design.

The London *Times* states that in a paper read December 7 before the London Automobile Club, W. R. Cooper of Swinburne, Cooper & Baillie, described some novel experiments for the purpose of examining the influences chiefly accountable for raising the dust accompanying the transit of motor cars. For this purpose an experimental apparatus was used consisting of a tricycle having two small wheels in front and an ordinary bicycle wheel behind. This was drawn over a patch of flour at speeds of about 20 miles per hour and instantaneous photographs were automatically taken of the large wheel, showing the cloud of flour that was raised. As the wheel was free from obstructions it was easy to study the action of the wheel alone in the first instance, after which various mud guards and bodies of one kind or another, made up of card board, were attached and the experiments repeated.

A number of lantern slides were shown, from which it was seen that the dust raised by a soft tire was more than by a hard tire and that it was also increased by

costing \$9,000,000. The work projected in the above programme, together with that included in the electric railroad projects which are expected to be put through, will call for about 1,000,000 tons of 80-pound rails in the next four years, and in addition 300,000 to 400,000 tons of iron and steel for car and locomotive building, switches, trestles and bridges. It is predicted that in the coming year Canadian railroads will require over 100,000 tons of bridge material for renewing and strengthening bridges, the Grand Trunk Railway alone needing for this purpose 30,000 tons.

For the purpose of obtaining a hard combustible, well adapted for use under boilers, an electric process recently adopted in England requires two and one-half hours and yields a material of high calorific value, almost smokeless and less expensive than ordinary coal. The basis is peat, which is placed in revolving cylinders, and the water (originally 80 per cent.) is largely driven off. A set of electrodes in the cylinder uses the mass of peat as a part of the circuit. The passage of the current warms and dries the peat, but without carbonizing it, and pulverizes it for the next stage in the process. The peat is then treated by a kneading roller and placed under an automatic press, which forms it into briquettes. It is then stored for final drying.

The Hill Iron Ore Properties.

BY DWIGHT E. WOODBRIDGE.

For some years the chief Mesaba iron ore interest, aside from that of the United States Steel Corporation through its Oliver Iron Mining Company, has been the so-called "Hill holdings." These are the range interests gathered into single ownership for the Great Northern Railroad by the genius of James J. Hill, his son, L. W. Hill, and their associates. There have been other groups of independent lands that have reached immense tonnages, such as those of Messrs. Congdon and Hartley and associates of Duluth, and of Messrs. Longyear and Bennett and their affiliations, but for various reasons these have been regarded as to some extent tied up. The Congdon and Hartley holdings have gradually and naturally gravitated toward the Oliver Iron Mining Company, which now holds most of them under what are known as the Chemung and Canisteo leases. The Longyear and Bennett lands are divided into two groups, in one of which the Pillsbury estate of Minneapolis holds a 50 per cent. interest, while in the second the Great Northern holds the same interest through its first purchase of Mesaba properties. The Pillsbury-Longyear-Bennett lands are out of the market for the present time, or are held at so high a royalty rate as to be so considered. There are some other independent holdings by lumbering interests of Minnesota and elsewhere, but these are either held at so high a royalty valuation that they are impossible at the present time or are absolutely withdrawn for future developments. These fee owners are not simple woodsmen, but astute men of the world, and they realize as well as their neighbors the trend of values and the closer and closer gatherings of ownership of producing mines.

Extent of the Hill Holdings.

While the Oliver Iron Mining Company lands are probably a long way in the lead of all holders in the amount of ore reserves, the Hill lands are a good second. Wild stories have been told of ore on the Hill lands, some estimates having been as high as 500,000,000 tons. Figures like those are merely the wildest guesses and are not based on any degree of information. It is a fact that few estimates, however moderate, are more than guesses. The Hill holdings have not been explored and there may be many millions of tons of excellent ore yet undreamed of; indeed, it is very probable there are. But with few exceptions these holdings so far explored and opened are not available for lease or sale by the Great Northern Railroad to any interest whatsoever, and most guesses and estimates of values in these lands, if they shall become the property of any interest, are based on all the ore in sight.

The largest body of ore yet found on Hill lands is the Mahoning mine. Figures of tonnage vary greatly, but I believe it safe to predict that it can produce 1,000,000 tons a year for 60 to 75 years and perhaps even longer. But this mine is the property of the Mahoning Ore & Steel Company, under lease from a Great Northern company, and is no more in Mr. Hill's hands for disposal than if belonging to the United States Steel Corporation. Indeed, a fourth interest in the Mahoning is held by the Oliver Iron Mining Company for the corporation. The Stevenson mine is another large and important property and is one of the great shippers from the Mesaba range. Its fee is also in the Great Northern, through a subsidiary company, but it is leased to Corrigan, McKinney & Co. and nothing less than a transfer from them would

have any effect on its ore. The same is true of most mines so far opened on the Hill land. Kinney mine is in the hands of the Republic Iron & Steel Company and will probably be held as long as that company shall have existence. Leetonia is leased by the Jones & Laughlins Steel Company and is surely not open for any change. All these mines, while classed as Hill holdings, which they are, cannot be turned over by the Great Northern and should not be included in any estimate of the tonnage deliverable by that road to any consuming interest. They are the Great Northern's while present leaseholds continue only so far as they may contribute to its coffers their annual royalties and the profit from the haul of their ore to Lake Superior docks.

Relations of the Hill Interests to the Steel Corporation.

It was about three years ago when reports of negotiations between the United States Steel Corporation and Mr. Hill were first published. At that time various estimates of tonnage were printed, all of them overlooking these mines already leased. No deal was then made and none has been announced since. It is certain that none had been consummated up to a very short time ago. The terms then proposed were for the carriage of all Hill ore by the Great Northern Railroad, and the guarantee by the Steel Corporation of a gradually increasing tonnage till that road should be moving, from all its mines, 10,000,000 gross tons per year. The rate of freight on all Mesaba ore to Lake Superior ports is 80 cents per ton, and this was to be paid by the corporation on the ore carried for it by the Great Northern. The railroad company was also to receive an added royalty above the rate that its own contracts with fee owners obliged it to pay them till the gross royalty should reach \$1; in case ore was mined off lands held by it in fee this entire royalty should accrue to the Great Northern.

It is absolutely impossible to estimate what this contract would have meant for the Steel Corporation. In the first place no one could tell the tonnage the corporation might be obliged to turn over to the road to make up its 10,000,000. And in the second place until one knew the mines from which this ore was taken the Great Northern's share of the royalty could not be approximated. It is not difficult to figure, however, what such a contract would have meant in gross for that road. The Great Northern is in the habit of hauling ore to its docks in about 2000-ton train loads. These trains make the round trip from mines to docks in 24 hours. As the average distance is about 115 miles each way, this is no difficult performance for a double track line having little other traffic and almost no delay at terminals. It is estimated that the cost of hauling ore from mines to docks is not more than 30 cents per ton, which would leave a profit of some \$5,000,000 on freights alone. If to this should have been added, say, 70 cents a ton royalty on the Steel Corporation's share and 25 cents on the remainder there would be, estimating its tonnage from other parties a trifle above at the rate of a few seasons past, not far from another \$5,000,000.

Hill Properties Not Being Freely Leased.

For the Steel Corporation such a contract would have been of value in two ways. It would have added greatly to its already vast ore reserves and thus assured a still longer lease of life and it would have aided in cutting out competition, for without ore there is little danger of any serious rivalry for the great American steel producers. For the Great Northern it would have given assurance of a steady traffic continued through many years. Possibly, also, it would increase the receipts from royalties, but that may be doubted, for the Great Northern Railroad,

whether it leased to the Steel Corporation or to others, would scarcely let its ore go for any less than its determined rate. But it is a fact that notwithstanding the failure of negotiations three years ago, the Great Northern has leased very few of its ore holdings since then, apparently keeping them well in hand for some important consideration that has even yet not been announced. The great bulk of Hill ore that three years ago was free for lease is still in a position where it can be turned to any single interest. And in the meantime vast additional reserves have been secured and are now held with the earlier ownerships.

Any such ore holdings must be reckoned with by steel makers in due time. In addition to the considerable tonnage shown on properties that have been explored and not leased to consumers there are many thousand acres lying on the formation and in portions that should be exceedingly productive. These lands have not yet been explored, or, if at all, have been so cursorily examined by occasional holes that knowledge concerning them is limited.

Hill's First Connection with the Mesaba Range.

Great Northern Railroad connection with the Mesaba range began when James J. Hill bought the Duluth & Winnipeg Railroad some ten years ago. That line ran from the city of Duluth northwesterly to Deer River, Minn., on its way toward Winnipeg and the grain fields of the Dakotas. Soon afterward he acquired the Duluth, Mississippi River & Northern Railroad and its associated companies and the lands held by its owners. This last was in 1899. The Duluth, Mississippi River & Northern had been built by the Saginaw lumber firm of Wright & Davis in order to carry out a contract with the Pine Tree Lumber Company, Little Falls, Minn. Wright & Davis had sold the Pine Tree Company its timber tracts in the vicinity of what was afterward the town of Hibbing—that is, in townships 57 and 58, ranges 20 and 21. They had then taken back a contract to log this timber at the rate of something like 50,000,000 feet a year and to deliver the logs in the Mississippi River at the mouth of the Swan, 35 miles south. This led to the formation of the Swan River Logging Company and the Mississippi River & Northern Railroad, the one to carry on logging operations and the other to handle the timber to the river. It so happened that Wright & Davis had bought for timber almost all the land along the Mesaba ore bearing formation from Hibbing to a point about seven miles west, and it was this timber they sold to the Pine Tree Company. They had retained the mineral rights, for the western Mesaba, around Hibbing, was then becoming known as a probable mineral center of some importance. Mr. Wright was an old man, several of his partners died rather suddenly, and, since the sale to the Great Northern of the Duluth & Winnipeg, of which he had been a director, his interest in the railroad situation waned. Times were rather unsettled and he was not a miner. So Mr. Hill bought the Mississippi River Railroad, the logging company, the Wright & Davis lands and all their holdings in this region for something less than \$5,000,000. It was a long headed purchase, for it has been since then returning at least 50 per cent. a year in profits directly derived from the purchase, while the indirect returns have been far more.

Iron Ore Hauling by the Hill Interest.

For some time Mr. Hill maintained the ore business of the Duluth & Winnipeg, with no great effort toward increase. The Mahoning mine was the leading shipper and in 1899 it produced about 750,000 tons. That year the road was extended easterly along the range to Virginia about 20 miles and the haul of ore from the Saunty and other mines of the American Steel & Wire Company was secured. This company was a new factor on the Mesaba and was taking several good properties. All its ore hauling was given the Great Northern Railroad under terminable contracts. In 1900 the haul of Commodore mine at Virginia was secured. This was given the road

by Corrigan, McKinney & Co. in return for an agreement to lease them the Stevenson ore body, which was located some miles west of Hibbing and was on Wright & Davis land. For some years this ore deposit had been offered almost anybody in the steelmaking business independent of the Carnegie and Minnesota Iron Company interests, but had been turned down by all. It is easy enough now to see how shortsighted these people were. Corrigan, McKinney & Co. mined about 56,000 tons of ore the first year from underground and then stripped the mine and the following season touched a production of 666,000 tons. Since then it has never been below 1,000,000 tons a year and its total to the close of 1905 is about 6,400,000 gross tons, an average of almost 1,100,000 tons per annum, from the inception of the enterprise. And Stevenson ore is a standard Bessemer, cheaply mined.

Result of the Formation of the Steel Corporation.

The Great Northern Railroad was gradually increasing its tonnage contracts, but was paying little attention to additional ore lands when in 1901 the United States Steel Corporation was formed. That took in at one swoop the bulk of the Mesaba range, as then discovered. Two railroads, the ore holdings of the Carnegie Company, the Federal Steel, the American Steel and Wire, the National Steel and other companies, holding both developed mines and a number of unopened but explored properties, were at once gathered together in combined ownership. That was naturally interpreted by Mr. Hill to mean that all the ore mined by the combination would be handled to the lake on one of the combination's own railroads, except where contracts otherwise provided. Many of these contracts at that time were terminable on due notice. Mr. Hill saw that this meant a definite limitation of his own ore traffic. He had already appreciated its earning capacity on a moderate annual business. He saw that to justify the immense investment required in rolling stock, terminal yards, ore piers, &c., he should have a growing and far larger traffic. This he must secure individually. He could hope for no assistance from the Steel Corporation, which had two railroads of its own, for which it would be anxious to provide a large earning power. It would not only carry its own ore, but would abrogate at the earliest opportunity what contracts had been made with him by some of its new subsidiary companies. He stood to lose the business of mines shipping to the American Steel & Wire Company, a business that in 1901 amounted to more than half a million tons. It behooved him to move at once; and he did so.

Hill Activity in Acquiring Ore Lands.

The headquarters of the Eastern Minnesota Railroad, which was the branch of the Great Northern handling its ore traffic, were located in Duluth, and Louis W. Hill, son of the president of the system, took direct charge. When Mr. Hill went to Duluth there were no maps of the mines owned by his company, no blue prints of the range and no data as to the ownership of its lands. There was little organization for the work he was to carry on, which was not only new to him but of a character entirely different from ordinary railroading. D. M. Philbin was then superintendent of ore traffic and was of exceedingly high value from his knowledge of the ore trade in general and the local conditions in particular. Maps were made, ownerships were determined along the range, explorations were undertaken and negotiations were begun for more traffic with independent miners and for control of additional lands.

The Great Northern Railroad was welcomed into the field. It gave competition, which had been lacking, and it aided the individual owner in disposing of his property to advantage. It was James J. Hill's opinion that the Steel Corporation would continue steadily the policy of gathering in ore lands that had been conspicuous in the management of the Oliver Iron Mining Company, when under control of the Carnegie Steel Company. There was even more need of great stores of ore now that the Oliver Company was to supply an all-embracing combination some units of which had been but poorly protected in the matter of raw materials. The same men were in direct supervision and it was natural to suppose they would continue the same policy. But for a time this

policy was changed. The new Eastern men in control were, to be sure, dominated to some extent by Wall street ideas, and the stock end of the proposition looked bigger to them than any other, and it was necessary that there be great earnings. These must not be interfered with or eaten into by any expenditures not absolutely necessary for the immediate addition of earnings. And ore was a long-time proposition. The immense tonnage in the ground under control of the corporation looked big enough to last indefinitely. For a time too these men did not appreciate the necessity of controlling all ore possible if the main object of the corporation, that of control, was to be most easily and surely carried out.

For a time therefore Mr. Hill had free rein. Most independent steel makers had not awakened to the situation and by a strange species of fatalism seemed to believe that the Lord would provide ore somewhere for all time to come.

Advantageous Position of the Hill Interests.

The Eastern Minnesota Railroad was able to get all the money it desired for the purchase of ore lands, at a low rate of interest. The credit of the Great Northern was back of it, and with its cheap money Mr. Hill was at an advantage over any competitor who might come into the field. He began to buy fees and to lease by the wholesale, but very quietly. The stocks of old companies that had been organized during the early days of the Mesaba, but had fallen into disrepute from their inability to develop their lands, were bought at remarkably low prices and the control of lands on the ore bearing formation was thus secured. Some of these companies held State lands and some of them were fee tracts. State leases were bought from their owners at advances in the actual price or in the royalties demanded. Large tracts were bought from private owners who had never carried on exploration and had little faith in their properties. These were bought if necessary on the principle of the small boys who trade in jackknives—"unsight unseen"—but they were bought cheaply and if a single mine could be found on them the cost price was a mere bagatelle.

In the meantime a large exploring business was developed and drills were put into operation at various points along the range, as far east as the center of T 58-18, near the Mountain Iron mine. Agreements had been made with the Rockefeller Interests some time before by virtue of which the Great Northern was not to go east of certain limits and the Rockefeller Interests agreed not to extend their western purchases. The great Wright & Davis tracts running for seven miles across T 57-21 and on into R 22 were the basis for the Hill holdings and other purchases were in a general way intended to round out this nucleus.

Competition among the fishermen on the east coast of England and Scotland has resulted in the development of a motor fishing boat of 80 tons displacement, 75 feet long, 22 feet wide and fitted with a gasoline engine of 24 horse-power running at 300 revolutions per minute. The engine, which is used only when winds are adverse or lacking, can give the craft a speed of 5 miles per hour; it is so placed as not to interfere with either stowage of fish or the manipulation of the sails, and its weight merely replaces to that extent the ballast previously carried. The idea of this form of boat is to allow individual crews to get their catch to market as soon as is the case with the present fleets of "drifters," who employ a steam craft to collect fish from each member of the fleet in turn, and then the entire catch is hurried to port, while the fishermen remain on the ground and continue their work. If the pioneer boat proves the success which is anticipated it is proposed to construct a considerable number of such craft for work of this character.

For measuring the depth of the ocean a new device has been invented which depends upon the constancy of the velocity of sound in a medium like water. It consists of a transmitter of sound waves, a receiver and some sort of a chronograph for recording time. The waves being reflected from the bottom, the depth will of

course be equal to one-half that indicated by the distance traveled by sound waves in water during the period of time elapsing between the sending of the signal and its return. A period of four seconds, for instance, represents a depth of 2640 yards, or $1\frac{1}{2}$ miles. It is obvious that without extremely sensitive measurements of time the device would be of value only in very deep water, for a depth of 30 feet would cause the sound wave to be reflected in 1-66 second.

Iron Ore Resources of Australia.

In view of the determination of the New South Wales Government to establish an iron and steel industry within the boundaries of the State, says the *London Iron and Coal Trades Review*, the question of the extent and value of the iron ore deposits of Australia is of importance.

The Government Geologist of New South Wales has estimated the ore in the discovered iron deposits of that State at over 59,000,000 tons. The chief deposits are at Cadia and Carcoar. The latter consists of over 3,000,000 tons of mixed hematite and ilmonite, and so far as worked has averaged between 50 and 60 per cent. of metallic iron, but it carries a rather high percentage in phosphorus. The ore in the Cadia deposit is estimated to consist of 39,000,000 tons of hematite and magnetite, carrying from 50 to 65 per cent. of metal, of which at least 4,000,000 tons are oxidized and suitable for the manufacture of steel by the cheaper acid processes. The balance (the unoxidized ore) contains a percentage of sulphur and copper. There is also a magnetite deposit of about 1,000,000 tons of 50 or 60 per cent. ore in the Queanbeyan district, but it is too far from coal to be capable of profitable working. Other large deposits occur in the Picton, Mittagong, Goulburn and Wallerawang districts; and at Cowra and Gulgong there are magnetite deposits which, though of comparatively small extent (not much over 100,000 tons a piece), are of such high class as to be worthy of note. Then there is the Blythe River deposit in Tasmania, estimated to contain 17,000,000 tons of ore.

Another State with splendid deposits is South Australia, the ore contents of one mine situated some 40 miles west of Port Augusta being estimated at 20,000,000 tons. Victoria is not known to possess any iron deposits, and concerning those in Queensland no definite data are available. The West Australian deposits are rich, but practically valueless for lack of a good coal field in the vicinity.

Australia's production of iron ore in 1903 was 22,000 tons from New South Wales, 9000 tons from Tasmania, 10,000 tons from Queensland, 33,000 tons from South Australia and a trifle from West Australia, the production of Victoria, like that of the outside colony, New Zealand, being nil. The total output was only 77,107 tons.

Gas Fired Steam Boilers.—An inquiry from a correspondent may be of interest to many of our readers who use natural gas under steam boilers, and we take this occasion to invite letters from those who can offer information of value from their own experience. The writer explains that at times during the winter the main supply pipes freeze up, decreasing and often entirely stopping the flow of gas, and that he is seeking a burner that will allow gas and coal to be fired at the same time, or a burner that can be easily removed, so that coal can be used while there is a shortage of gas. The writer suggests that a burner that could be used simultaneously with the burning of coal on the grates would fulfill the ideal conditions. If any of our readers have knowledge of such a burner or could suggest expedients to ameliorate the difficulties mentioned we would be pleased to hear from them.

A non-union workman was shot and killed in a fight with 20 strikers at Newark, Ohio, last week. This is the third death resulting from the strike of 300 metal polishers at the Wehrle Stove Works, which began in July, 1905.

Manufacturing Buildings in Cities.

BY WALTER S. TIMMIS.*

The country and suburban manufacturer is often amazed at the enormous amount of manufacturing done in large cities, where land is so valuable. In New York, Brooklyn, Chicago, Philadelphia, Boston and other crowded cities the number of factories continues to increase in spite of the apparent advantages offered the manufacturer in the country and in smaller suburban towns.

There are many reasons for this, one of which is that it is usually much easier to get competent help and a large selection of it in cities than in the sparsely settled districts in the country.

To the uninitiated it would seem a hopeless task to build, equip and run a manufacturing plant in the city in competition with the buildings erected on low priced grounds and operated in communities where taxes are low and miscellaneous help cheap. There are nevertheless many lines of manufacturing where the value of the product is large for the size of the building required which may be profitably manufactured in large cities. Buildings in cities are necessarily several stories high, and while it is generally understood that manufacturing carried on on one floor is cheaper than manufacturing carried on on several floors, there are advantages not to be despised in having a large floor area compactly situated and easily reached by means of rapid elevator service.

To progressive manufacturers the problem is often presented of either moving, enlarging or building. The questions are: Shall we stay in the city or go into the suburbs? What will be the best form of construction if we build? What is the ideal form of building? What is the cheapest form of fire proof construction? What is the best form of insurance protection? If we go into the suburbs what will be the cost of keeping a city office, and what will the effect of it be upon our business. The problems of transportation, power, lighting and power transmission all have to be considered in cases of this character.

Location.

The location of a plant will have to be determined by a number of factors; the labor market and rate, cost of land, style of building contemplated, insurance, character of product manufactured and its distribution. Many manufacturers prefer the larger centers because it gives them a good labor market, and while the investment in land is high, these high land values usually increase in value sufficiently to cover the cost of depreciation in the building and in some cases more than cover it; besides, it is much easier to finance a city property than a property located in the country. Trust companies and other financial institutions are unwilling to make any extensive bond or mortgage loans on isolated suburban property, whereas in suitable city locations and on substantial buildings erected so as to be easily rentable for general manufacturing purposes very generous loans are readily negotiated at low rates of interest.

The problem of location is of primary importance and must be determined with reference to each individual business. For the guidance of those not familiar with real estate values the following will give some idea of manufacturing possibilities in New York City:

Real estate downtown in Manhattan within 1 mile either north or south of City Hall and within two blocks of Broadway will at present cost \$25 per square foot; more than two blocks away, east or west, \$12 to \$20 per square foot; between Twentieth and Twenty-eighth streets on the extreme East Side, \$5 to \$10 per square foot; West Side property, Thirtieth to Fiftieth streets, \$10 to \$20 per square foot, depending on location, and Bronx property costs from \$1.50 to \$2.50 per square foot. Manufacturing sites can be obtained in Brooklyn in good locations at from 75 cents to \$1.50 per square foot. Several acres of floor space will soon be available for renting in Brook-

lyn for manufacturing purposes, in good, light, fire proof buildings at from 23 to 26 cents per square foot of floor space.

Modern manufacturing buildings in the smaller towns can be built complete either of "mill construction" or of "modified mill construction" for from 70 cents to \$1 per square foot of floor area, depending on the location and the size of building, while modern fire proof buildings of steel and terra cotta fire proofing such as are erected in the larger cities will cost from \$2 to \$3 per square foot. Buildings of the new reinforced concrete construction can be built in cities for about \$1.20 to \$1.30 per square foot of floor area.

Taking an average height of ceiling to be 11 feet, then



Fig. 1.—An 8-Story Reinforced Concrete Building.

the costs of various constructions per cubic feet, including excavations and roof, will be as follows:

Average Cost Per Cubic Foot of Manufacturing Buildings.

Style of building.	Location.	Price per cubic foot.
Mill construction.....	Large cities.	8½
Mill construction.....	Country.	6
Fire proofed steel and terra cotta.....	Cities.	20 to 25
Fire proofed steel and concrete floor.....	Cities.	15 to 18
Reinforced concrete.....	Cities.	9 to 10

The above figures are based upon buildings costing from \$75,000 to \$100,000, but of course there will be variations from these figures, depending on shape of plot and general internal arrangement of columns and other obstructions.

Rents and Power.

The rents in New York City for space in good, light fire proof buildings are from 40 to 60 cents per square foot of floor area measured to the outside of the walls. This usually includes elevator service and heat, but does not include light or power. Power is sold at from \$50 to

* Consulting engineer, New York City.

\$60 per horse-power per year, when delivered from shafting and electrical power is sold from 10 to 5 cents per kilowatt hour, which is 1 1-3 horse-power hour, the rate usually depending on the amount used and the ability of the consumer to make satisfactory terms.

The New York Edison Company's rates for power now prevailing are as follows:

For the first 200 kilowatt hours of monthly consumption, 10 cents per kilowatt hour.
 From 200 to 400 excess over 200 hours of monthly consumption, 8 cents per kilowatt hour.
 From 400 to 3,500 excess over 400 hours of monthly consumption, 6 cents per kilowatt hour.
 From 3,500 to 7,000 excess over 3,500 hours of monthly consumption, 5 cents per kilowatt hour.

The above rates prevail for use of current less than 10,000 kw. hours per month. Inasmuch as 10,000 kw. per month will run a very large plant, the majority of power consumers will come under the schedule as above given.

forms of steel construction have been adopted and used in connection with a large variety of brick and terra cotta arches between the floor beams and with various combinations of reinforced concrete construction to span between the floor beams, the main weight, however, being carried on a steel frame work. With the introduction of reinforced concrete construction, which utilizes a comparatively small amount of steel, it has been found possible to construct absolutely fire proof and rigid factory buildings at a rate very slightly in excess of the cheap form of mill construction which till recently has been used so largely. It is a mistake to think that the introduction of reinforced concrete will mean a decreased use of steel for building purposes, as the type of construction principally superseded will be the mill type, which uses little or no steel.

While concrete as a building material has been used for a long period of time, the method of utilizing con-

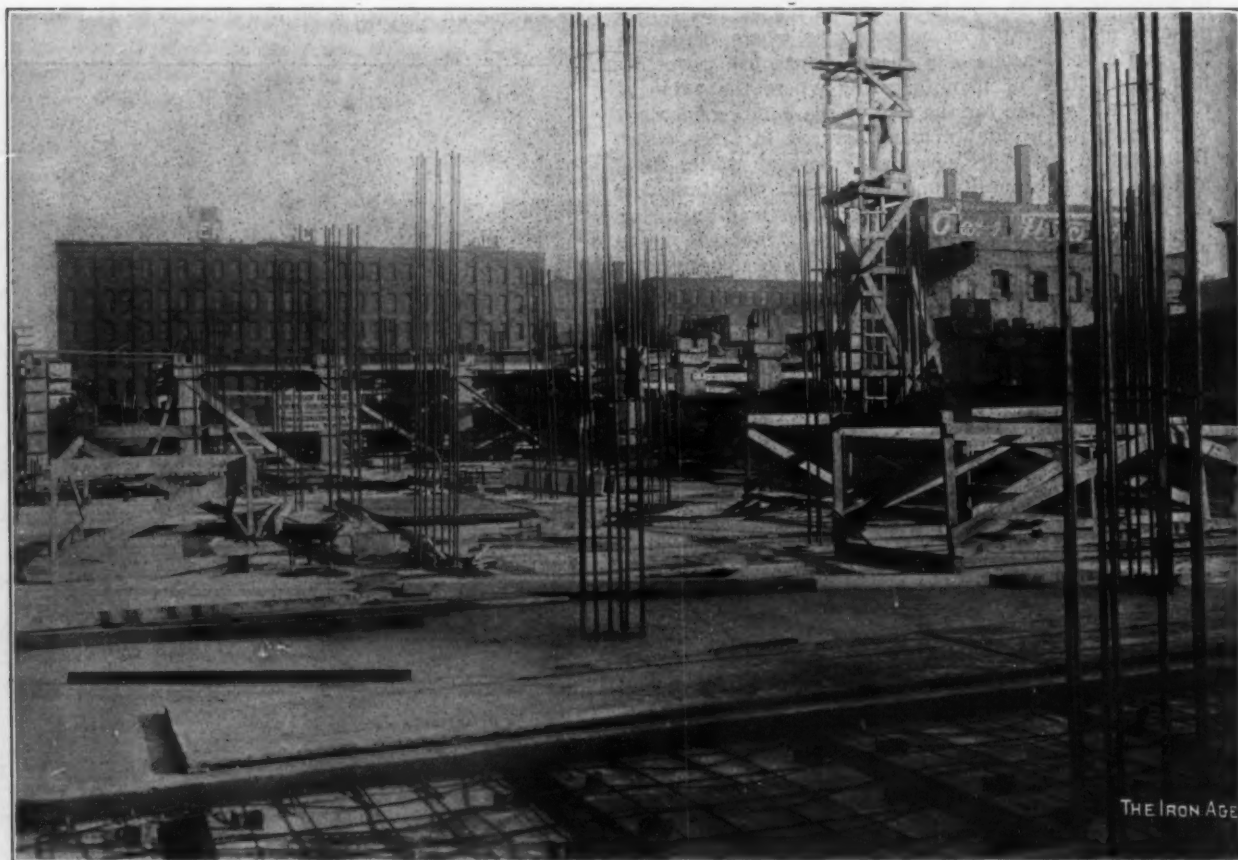


Fig. 2.—The Second Floor During Construction, Showing the Round Rods for Reinforcing the Columns.

The New York Edison wholesale rate for power is as follows:

For the first 15,000 kilowatt hours' monthly consumption, 5 cents per kilowatt hour.
 From 15,000 to 25,000 excess over 15,000, 4½ cents per kilowatt hour.
 From 25,000 to 35,000 excess over 25,000, 4 cents per kilowatt hour.
 From 35,000 to 50,000 excess over 35,000, 3½ cents per kilowatt hour.
 All over 50,000, 3 cents per kilowatt hour.

Forms of Construction.

Among the various forms of construction available for factory purposes are the mill construction, modified mill construction, steel construction with concrete floors, steel construction with terra cotta arches, and reinforced concrete. The first two of these may be classed as "slow burning," or "mill construction," and the last three as "fire proof construction." The mill construction has been used very largely for many years, both in cities and in the country, for the reason that its cost was much lower than any form of steel construction.

Owing to the need of more rigid construction for factory purposes, together with fire protection of a better quality than is afforded by the mill construction, various

crete reinforced by steel has a comparatively recent origin. The use of concrete with steel bars or wire dates back some 30 years. Originating in France, this early work has grown gradually up to the successful combination of the two materials into a standard form of building construction. Probably the first work done in the country was in the early eighties by Ernest L. Ransome in California. One of the first examples in this section of the country was the large factory of the Pacific Coast Borax Company, erected in Bayonne, N. J., in 1898. From this time the use of reinforced concrete has grown very rapidly in many classes of work. There is an example of a very tall building in Cincinnati, 15 stories high, which was built in 1903. The new Naval Academy in Annapolis is of reinforced concrete; the new Military Academy to be built at West Point will be of the same construction. Examples of this work can be seen in the plants of the United States Shoe Machinery Company at Beverly, Mass.; the Foster-Armstrong Works at Rochester, N. Y.; the Robert Gair Building in Brooklyn, which is of recent construction, and many others in New York City and in various parts of the country.

Many tests have been made both here and in Europe to develop reliable data for determining the stress in the

combined materials due to the effect of the live loads and the action of fire, water and weather. It is found that concrete weathers as well as most building stone and it is said that it improves in strength and hardness with age.

Vibration.

There is probably no construction which gives greater rigidity for the same cost than reinforced concrete. The American Book Company of Cincinnati, which is running its printing plant in an eight-story building of this construction, states that there is practically no vibration in the building. The printing room contains 21,000 square feet of floor space, in which 25 printing presses are running, most of them weighing 13 tons each, while there is ample space for additional machinery. According to the company's statement, "there is practically no perceptible vibration when standing by the press and no perceptible vibration whatever in the columns or walls.

terials; some of these tests in recent years have been directed by Prof. Ira H. Woolson of Columbia University for the department. In one of his reports he states as follows:

"The fact that concrete can withstand such very severe tests is sufficient proof that it may conservatively be adapted for factory buildings. The heat undoubtedly drives off some of the water of crystallization, thereby reducing the strength of concrete on the face of the part attacked by the heat; this loss of strength is very slow and gradual. A heat of 1700 degrees F. maintained for four hours will not penetrate the surface more than 1 inch. It is not reasonable to expect any such long duration of heat under service conditions. It is also interesting to know that the concrete will again take up this water of crystallization and regain very largely its lost strength."

The fire in the Bayonne plant of the Pacific Coast

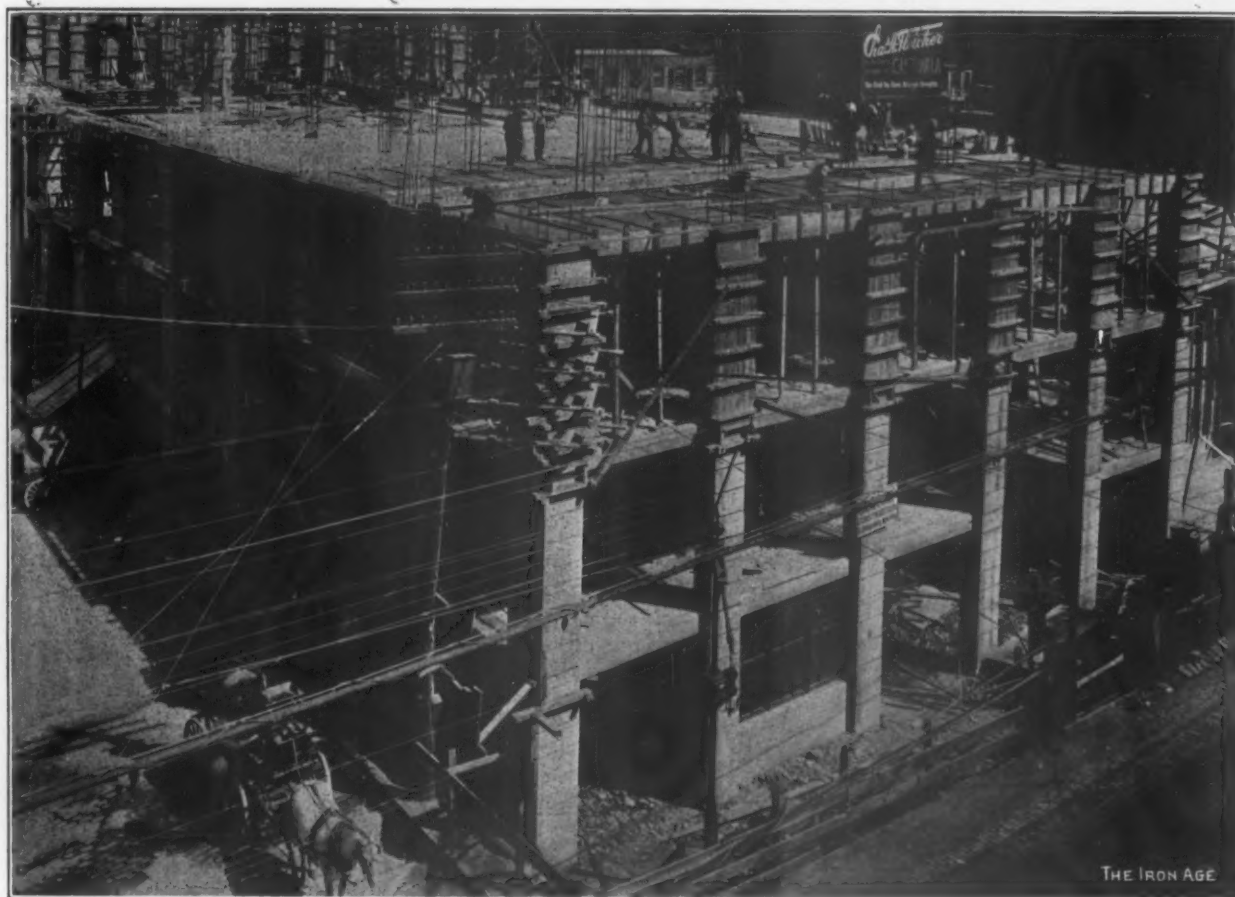


Fig. 3.—The Building Completed Up to the Fourth Floor and Forms Erected for the Fifth Floor Columns.

The building is in this respect superior to our expectations, and we have no hesitancy in saying that a building properly constructed of concrete is an ideal one for machinery in motion."

The Ketterlinus Lithograph Mfg. Company, Philadelphia, has built an eight-story reinforced concrete building which is giving entire satisfaction.

There is no doubt that printing presses in motion are as severe a test for vibration as any that can be found. It is of very great importance to the owners of plants of this character that when once their machines have been adjusted and the running parts properly aligned they remain in this condition and do not require repeated resetting. The nonalignment of machinery of this character seriously affects the character of the work produced from the presses and is exceedingly detrimental to the running of the machinery itself.

Fire Proof Qualities.

To-day a building material, to be acceptable, must also pass a test of the combined action of fire and water. The Department of Buildings of New York City has conducted a large number of tests of various building ma-

Borax Company, which occurred in 1903, did not damage the concrete construction more than \$1000. The building, which was 200 x 250 feet, consisted of four stories and a rear portion one story high. The foundations, walls, floors and columns were built of concrete and cold twisted steel, but the roof and posts supporting it were constructed of wood. The building contained a large quantity of wooden partitions and framing for shafting, machinery, bins and stairways. The fire originated in the one-story part and burned through the wooden roof and partitions separating it from the four-story portion, and then swept up through the elevator shaft and stair wells to the fourth story. The roof was completely destroyed. A steel dust collector, weighing about 30 tons, supported on the roof fell 14 feet to the fourth floor below without serious injury to the floor. A few of the floor beams subjected to the shock were slightly cracked, but were otherwise uninjured. With the exception of the cracking of a few beams on the fourth floor, the punching of one hole in the floor slab, some scaling off of the plaster and whitewash, the entire concrete portion of the building was structurally uninjured by the fire.

The Baltimore fire also demonstrated very clearly the superiority of reinforced concrete for fire proof construction.

Costs of Reinforced Concrete.

With reference to the costs it is impossible to give definite figures or to give comparisons that will apply to all localities. In New York and Brooklyn six-story factories of reinforced concrete will not exceed the cost of mill buildings of brick and yellow pine by more than 5 to 10 per cent., and under some conditions not as much as 5 per cent. Reinforced concrete construction has the added advantage that the height of the building is not limited to six stories by the building laws and the owner can erect a larger building on his property and thereby obtain a more profitable investment.

In concrete buildings the construction is of equal if not greater importance than design and all work should be done under experienced and competent supervision. The cement, sand and stone should all be carefully inspected and proportioned to give the best concrete. The cement should be mechanically mixed, the steel should be

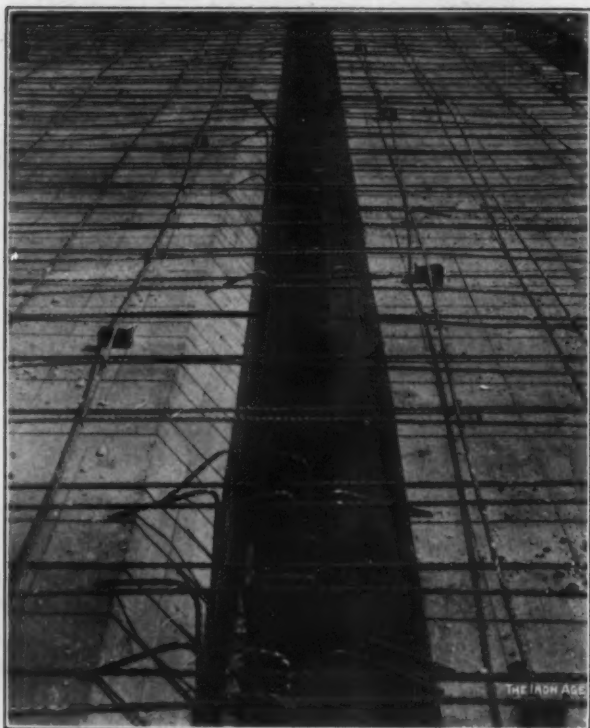


Fig. 4.—Detail of Floor Construction, with Wooden Forms and Reinforcing in Place.

secured in position before concreting, and tests made regularly on the cement by means of cubes made from each day's work and load tests made on floors. Under proper supervision large factories and mill buildings can be constructed of reinforced concrete which will be superior in many respects to the old style brick and timber construction and probably equal in every respect to the best buildings that can be built of brick, steel and terra cotta.

A Recent Example of Reinforced Concrete Construction.

The accompanying illustrations show one of the most recent examples of a successful reinforced concrete building. It is eight stories high, 100 x 200 feet, and was built for the Robert Gair Company of Brooklyn, the work being performed by the Turner Construction Company, New York. As will be seen from Fig. 1 an unusual amount of window surface is provided; in fact, this window surface is more than 50 per cent. of the wall space. Figs. 2 to 4 show different parts in the work of construction, and Fig. 5 taken in the interior of the seventh floor gives an excellent idea of the clean cut nature of the work. The finish on the columns, girders and beams consisted of one coat of cold water paint applied with a brush. Special attention is called to the manner of hanging the sprinkler pipes and the wiring, which is done without molding or conduits.

The footings were made 12 feet square, reinforced with twisted steel rods, the pressure in the footings being estimated at 2 tons per square foot when all floors are fully loaded. The exterior footings under the walls consist of continuous girders made up of reinforced concrete. The columns are spaced 16 feet by 16 feet 4 inches and the beams are spaced 5 feet 4 inches, there being three beams to a bay. The floor slab is 4½ inches thick, which includes ¾ inch of Portland cement mortar containing equal parts, ½ of cement and sand, troweled to a hard finish surface. All concrete for floors was mixed in the following proportion: One part cement, 3 parts sand and 5 parts trap rock passed through a ¾-inch screen.

The floors were designed for a live load of 200 pounds per square foot, and load tests were made up to 600 pounds per square foot, which showed that the maximum deflection of the girders under these conditions did not exceed 3.32 inch, and the deflection of the beams did not exceed ¼ inch during these tests; no signs of injury to the concrete were observable.

The interior columns, which are square with rounded corners, are reinforced with vertical rods running through two stories, and connections are made 12 inches or more above the floor line. The ends of these rods are threaded and connected with nuts, which has the effect of making the vertical steel members continuous. The concrete for all the interior columns consists of 1 part Portland cement, 1 part sand and 3 parts trap rock.

The building has been provided with three stairs, which are inclosed in fire proof partitions, the stairs being constructed of reinforced concrete, the finish of the risers and threads being similar to the finish of the floor in the building. The partition walls, which inclose the stair and elevator wells, are constructed of 4-inch concrete reinforced with vertical and horizontal steel rods.

The building is provided throughout with a sprinkler system, and is constructed and equipped in this respect to meet the requirements of the Associated Factory Mutual Companies of Boston, which of course gives the owner an exceedingly low rate of insurance.

Insurance on Manufacturing Plants.

Insurance rates on manufacturing plants in cities are generally very high, owing to the lack of facilities for fighting the fire within the building; also to the character of the construction of many manufacturing buildings. Wherever possible it is advisable to install a fire fighting system which will be complete in itself. Such a system is embodied in the requirements of the Associated Factory Mutual Companies of Boston, and consists primarily in a reservoir supply of water, a steam pump of sufficient capacity to empty the reservoir in about one hour, a system of tanks located about 20 feet above the highest point of the roof and a sprinkler system fed from these sources of supply.

With a system of this character installed in a reinforced concrete building which is not unduly exposed to contiguous fire risks there should be no difficulty in obtaining an insurance rate which would cost not more than 15 cents per \$100. One of the chief advantages of reinforced concrete over the mill construction for factory buildings lies in the lessened amount of damage due to water, which will always run through the floors of a mill constructed building during a fire, when either the city fire department is operating or when the sprinklers have become effective. In a recent fire which occurred in a reinforced concrete building the damage was confined to that section of the floor in which the fire originated. The water used in putting out the fire only passed down the stairways and elevator shafts, none of it finding its way to any of the floors below.

Power Plants.

With the advent of direct connected motor driven machinery modern power plants usually consist of direct current generating sets, which generate direct current at 240 volts which is usually distributed at 230 volts for power and 115 volts for light.

The exhaust steam from a plant sufficient to run the power and lighting of the building will be usually sufficient to heat the building. It has been found by ex-

perience that almost the same amount of coal is used for heating a building as for running a plant, which includes the supply of power and light. It is therefore evident that condensing engines cannot be used with any advantage during the period of time in which heating is required. Single or compound high speed direct connected engines and generators are usually employed; compound engines can only be employed to advantage where there is a fairly constant load value.

For buildings of this character it is usual to install electric elevators, which run economically and give little or no trouble. The wiring system should consist of two-wire feeders for power and three-wire feeders for light, these feeders being kept separate. It is well to have power and light feeders for each separate floor in order to simplify the problem of distribution. The general lighting of buildings of this character should be by 5-ampere arc lamps; one arc lamp per 1000 square feet of floor

for successful operation. The boiler now in use at the locomotive testing plant at Purdue University was designed for 250 pounds pressure. After 30,000 miles running the fire box side sheets required renewal and there has been considerable leakage of tubes, staybolts and mud ring. The previous boiler, which was worked under lower pressures, gave little trouble from these causes. Professor Goss, who has been conducting the investigations at Purdue on high boiler pressures, believes that final results will show that in the Western country 200 pounds is too high for best results.

Gas Prices in England.—Some time ago, says an English exchange, the Birmingham City Council decided to supply gas for gas engines at 1s. 10d. (44 cents) per 1000 cubic feet, with 5 per cent. discount for prompt payment, the prices paid before by consumers being from

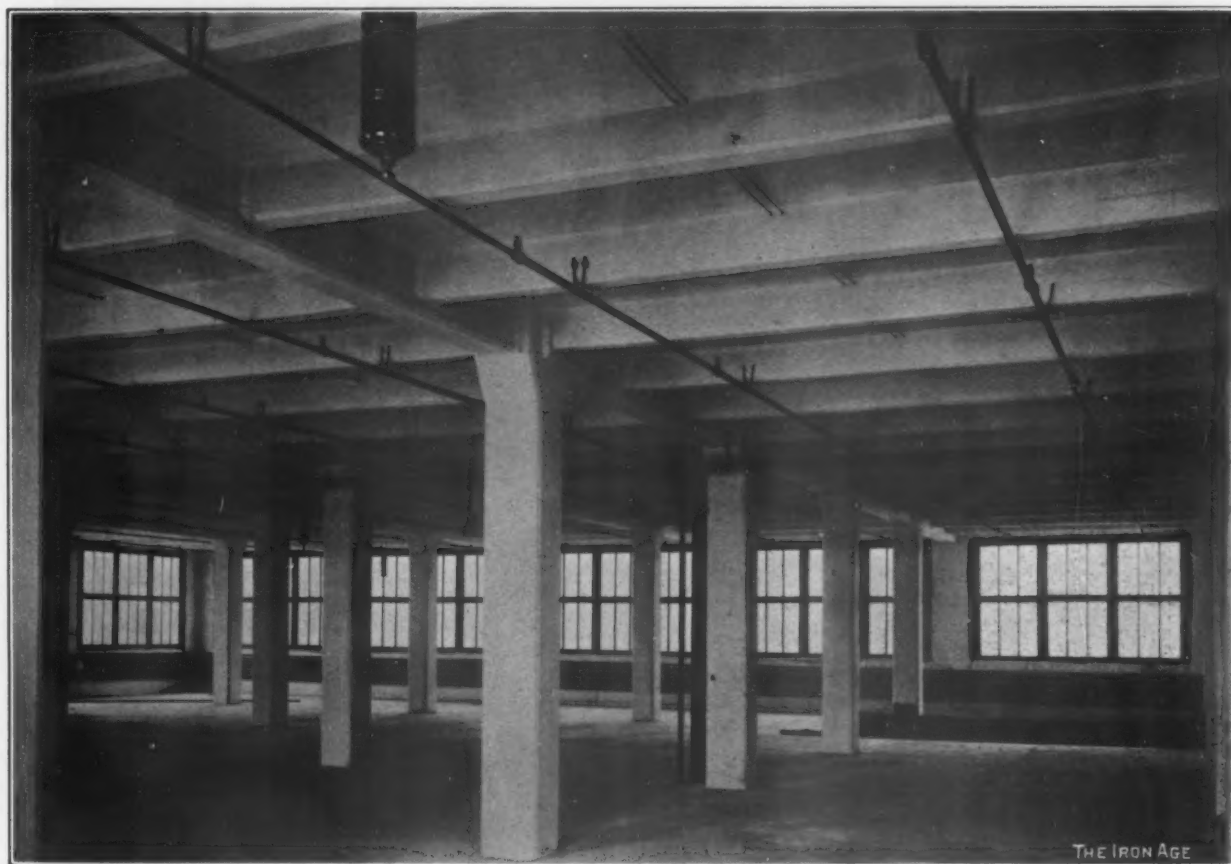


Fig. 5.—Completed Interior of the Seventh Floor, Showing the Sprinkler Piping and Wiring.

area will give good results. Any specific local lighting can be taken care of by incandescent drops.

Small plants of this character run in cities can be operated so that the cost per kilowatt-hour, including interest and depreciation on the plant and heating of the building, will be not more than 5 cents per kilowatt-hour when generating 600 kilowatt-hours per day, and not more than 3½ cents per kilowatt-hour when generating 1200 kilowatt-hours per day.

Lower Boiler Pressures for Locomotives.—It is noted by the *Railway Age* that there is some reaction from the tendency of recent years to increase the working pressure for locomotive boilers. In 1885 150 pounds was the standard pressure, this being gradually increased, until in 1900 200 pounds was tried by a few roads, and since that time it has been generally introduced. Signs are now seen of a decided change. While some roads have gone as high as 210 to 220 pounds the limit is now 200 pounds, with a tendency to go below that point rather than above it. For shell boilers, with fire tubes and staybolts, 200 pounds appears to have overreached the mark

2s. to 2s. 6d. (48 to 60 cents), according to consumption, whatever might be the purpose the gas was used for. Since then a good deal has been heard from users of gas engines of the advantages of the suction producer plant and the gas committee now recommends a further reduction. The portion of its report which refers to this matter is as follows: "Considerable development in the perfecting and in the manufacture of gas producer plants has recently taken place and the attention of Birmingham manufacturers has been directed to the cost at which such gas can be produced, with the result that a number of the plants have already been supplied to manufacturers within the Birmingham area of supply. The quantity of gas supplied by the department for use in engines is approximately 960,000,000 cubic feet per annum, or about 15 per cent. of the total quantity sold during the year ended March 31, 1905. The following are the charges now to be made for gas used exclusively for motive power purposes: On consumption in one premises of under 100,000 cubic feet per quarter, 1s. 10d. (44 cents) per 1000 cubic feet; over 100,000 cubic feet per quarter, 1s. 7d. (38 cents) per 1000 cubic feet, less the usual discount of 5 per cent. for prompt payment."

Large Electrically Driven Lathes.

BY FRANK C. PERKINS.

Electric motor drive is generally conceded to be the most satisfactory for machine tools of almost every description, particularly high power lathes of large diameter. These are used principally in machine shops that construct large engine fly wheels and electric generators having revolving fields of large diameter which require no additional fly wheel for aiding in proper speed regulation of the large reciprocating engines.

The accompanying illustrations show several electrically operated lathes with work mounted on them ready for operation. It will be noted that the arrangements for driving and mounting the tools differ in the

friction drive, the power being transmitted to the periphery of the face plate by a friction roller $1\frac{1}{4}$ feet long and $1\frac{1}{2}$ feet in diameter. This tool may also be operated as a boring machine or as a lathe, a slotted cast iron floor plate being arranged on the three sides of the pit on which the work may be erected or on which the cutting tools may be fastened when the fly wheel, rotor, armature or stator is mounted on and swung by the face plate. An independent electric motor is used for driving the feed mechanism of the tool carriages, this motor being controlled by a feed regulator so that the rate of feed may be varied from less than 1-16 inch to nearly 3 inches per minute, in accordance with the movement obtained by the use of gears, cone pulleys or other mechanical speed changing device, while by mechanical methods it is possible to change the speeds 10 per cent. per step. In

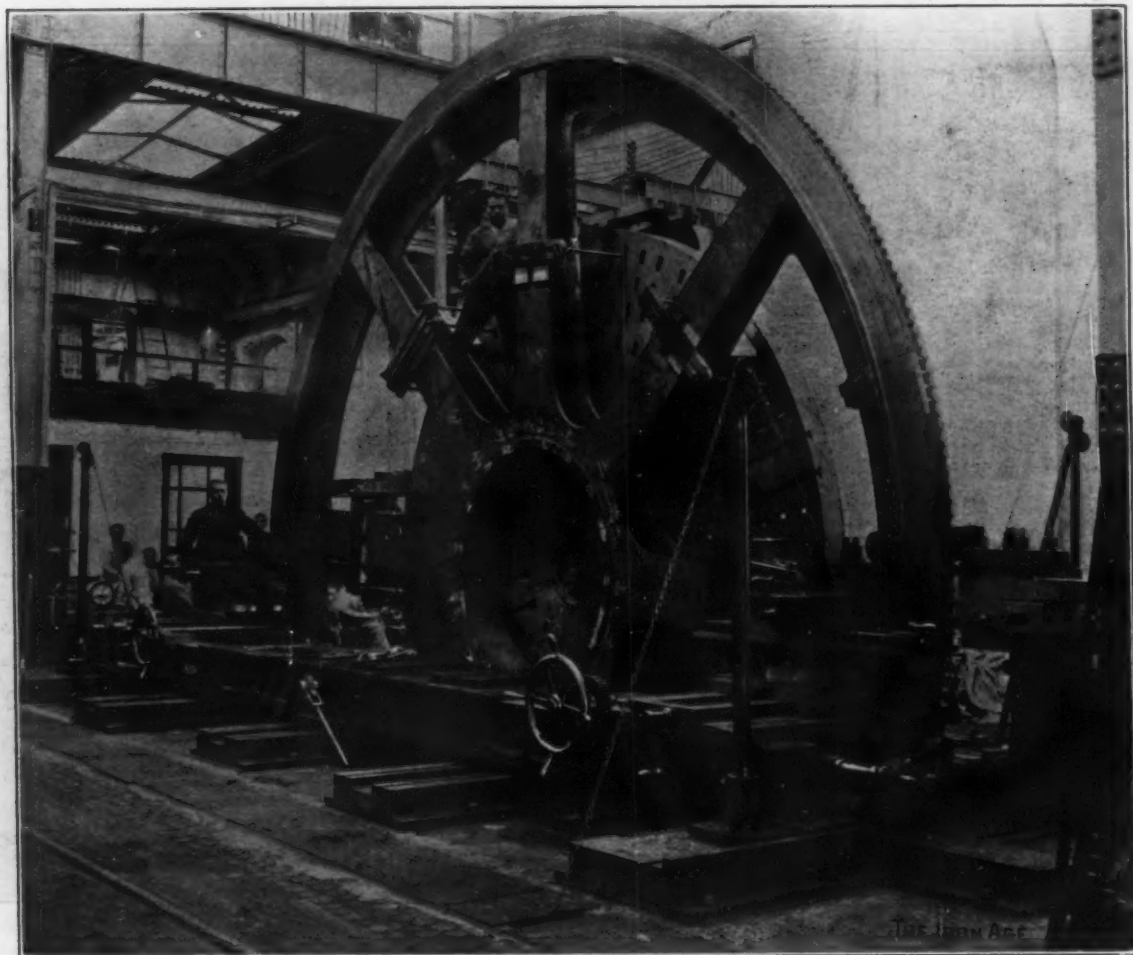


Fig. 1.—Large Diameter High Power Lathe in the Works of Brown, Boveri & Cie, Baden, Switzerland.

shops of the various countries represented. Large lathes with various methods of drive are in operation at Baden, Switzerland, at the works of Brown, Boveri & Cie., and at the shops of the Maschinenfabrik Oerlikon, at Oerlikon, near Zurich, as noted in the accompanying views, Figs. 1 and 2. One of the principal electric works using these large tools in Germany is that of the Elektrizitäts Actien Gesellschaft, formerly W. Lahmeyer & Co. For boring out stators of motors and alternating current generators ranging in size up to 5000 horse-power, enormous electrically driven lathes are also utilized. In some instances boring machines are arranged with vertical revolving shaft and horizontal face plate, the motor driving mechanism being located in the pit and the large stator of the alternator securely mounted on a slotted cast iron floor plate.

The accompanying drawing, Fig. 5, shows a 44-foot pit lathe in operation in the Bullock shops of the Allis-Chalmers Company, with a face plate 30 feet in diameter, the pit having a capacity for swinging a casting 12 feet long and more than 40 feet in diameter. This large tool is operated by a 60 horse-power motor operating the lathe by

usual practice the changes are more often 50 per cent. per step and frequently double this amount, in order not to complicate the construction of the tool excessively.

Examples of modern electrically driven lathes in use in American shops with various driving arrangements are shown in Figs. 4 to 7.

When driving a lathe or other machine tool electrically the changes of speed may be made to vary gradually and between very wide ranges by the use of various systems of electric speed control and various types of variable speed motors. When a machine is driven by a belt or a constant speed motor, to keep the cutting speed at a maximum, considering the kind of material cut, the quality of the cutting tool and the diameter of the work, change gears are employed, usually with cone pulleys. While these mechanical speed changes are not so gradual as those obtained with variable speed motors it is the only alternative when driving by overhead shafting or induction motors, although the latter are now constructed for two or more speeds and are utilized to good advantage with mechanical speed changing devices. Even with the best variable speed motors of the direct current type

and the use of two or more voltages, in many cases it is found desirable in the electric driving of lathes to utilize one or more changes of speeds by means of back gears or cone pulleys.

One electric firm in Austria-Hungary installs 3-phase motors under the head stock of the lathes, below the floor level, driving the former by means of belts and cone pulleys as well as gearing. A motor driven screw cutting lathe of 13 inches swing and 21½ inches gap is equipped with a 2 horse-power motor operating at a speed of 1440 revolutions per minute at full load and is provided with a belt tightening arrangement. The first speed reduction gear lowers the speed to 240 revolutions per minute, the second to 60, the cone pulleys being mounted on this shaft. These Austrian 3-phase motors are largely used for operating machine tools and very successfully. As to whether the best all-around results are given by the 3-phase or the direct current systems

disengaged by a friction clutch and connected with a cone pulley under the head stock end of the lathe in a box section base with levers for changing the speed of the spindle. A Westinghouse induction motor of 2½ horse-power capacity is used in this instance and it is stated excellent results have been obtained.

Where particularly fine work is required from an engine lathe the tool is placed upside down and the lathe reversed, thus bringing the tight side of the belt on the working side, where many engineers claim it ought to be, the belt pulling against the tool instead of up and with the tool. The usual way of driving a lathe from overhead shafting by pulling up on the spindle is opposed to well established mechanical principles. The belt in pulling up on the spindle is throwing all the wear on the cap of the box and all the strain on the top of the head stock and is pulling up and away from the tool, the slack side of the belt being on the working side. If the belt is



Fig. 2.—High Power Lathe Swinging the Revolving Field of a 1500 Horse-Power Three-Phase Alternator in the Oerlikon Works, Switzerland.

for electric driving of factories and workshops is a matter of opinion largely. The strongest supporters of the alternating current system lay great stress on the difficulties arising from the use of the commutator, while the advocates of the direct current system bring out the point strongly that the induction motor is essentially a constant speed machine. Unquestionably the 3-phase installation complete from the power house to the machine tools about the shops and yards of a large plant is very flexible and reliable and is cheap to maintain as well as install. The weak point of the 2-phase or 3-phase alternating current motor is its inability to give an economical speed regulation over a wide range, and in this it cannot hold its own with the direct current motor.

For operating lathes from below the floor or from the base of the machine tool a number of arrangements have been tried with more or less success. The Craft's system of driving machine tools requires a basement under the ground floor of the machine shop, or a pit is prepared under the machine, unless, as in the 24 inch by 12 foot engine lathe, Fig. 8, the motor is placed in a box section base under one end of the lathe. In this case a rawhide pinion is placed on the end of the armature shaft and drives a shaft running along the lathe, engaged and

pulling down and against the tool it has a tendency to steady the spindle and eliminate chattering.

A number of multispeed motors and variable speed systems of electric control have been used in America with more or less success in lathe work. These include the single voltage system, in which the speed variation is accomplished by weakening the field; the three-wire system, using two like voltages, and the multiple voltage system, using three or four wires and several voltages obtained by various combinations and connections. With the single voltage system the field is weakened mechanically in some cases, as with the Stow multispeed motors, the poles of the motor being made up of a stationary shell and a movable core. When the cores are in their normal position, close to the armature, the air space is a minimum and the field strength a maximum. As the cores are withdrawn the air space is increased and the magnetic field strength reduced gradually, the speed of the motor being increased accordingly. In other cases with the single voltage system the field is weakened by means of rheostats, and where specially designed motors have been utilized a variation in speed has been obtained as high as 6 to 1. On three-wire voltage systems where the pressure is the same between the

neutral and either of the outside wires a speed variation of 4 to 1 has been obtained without difficulty, while speed changes as high as 10 to 1 have been obtained with the best designed multiple voltage systems.

When alternating current induction motors are used in driving lathes and in nearly all cases when direct cur-

is the simplest system of speed control, but it is also very inefficient. For the intermittent work of a lathe turning off the side of a crank, for instance, with speed regulation by rheostat control, the speed will increase enormously when the tool leaves the work and will drop to a low point when the tool is cutting, frequently ruin-

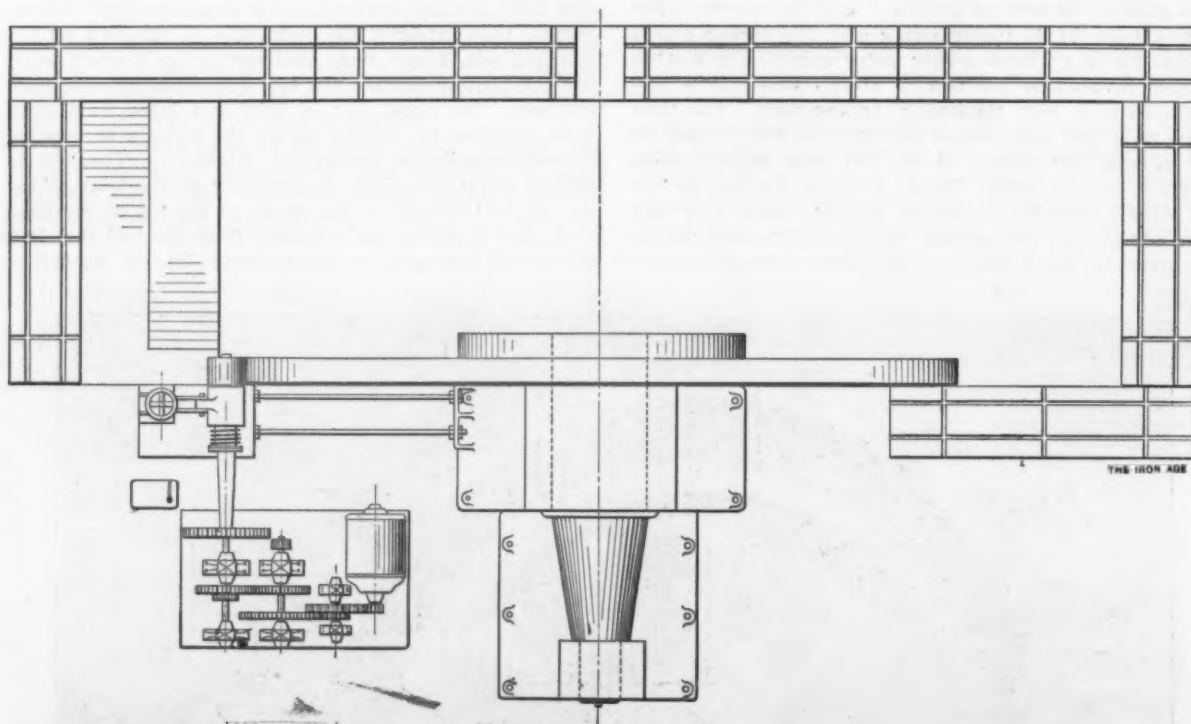


Fig. 3.—Plan of Large Pit Lathe in the Bullock Electric Works of the Allis-Chalmers Company, Cincinnati, Ohio.

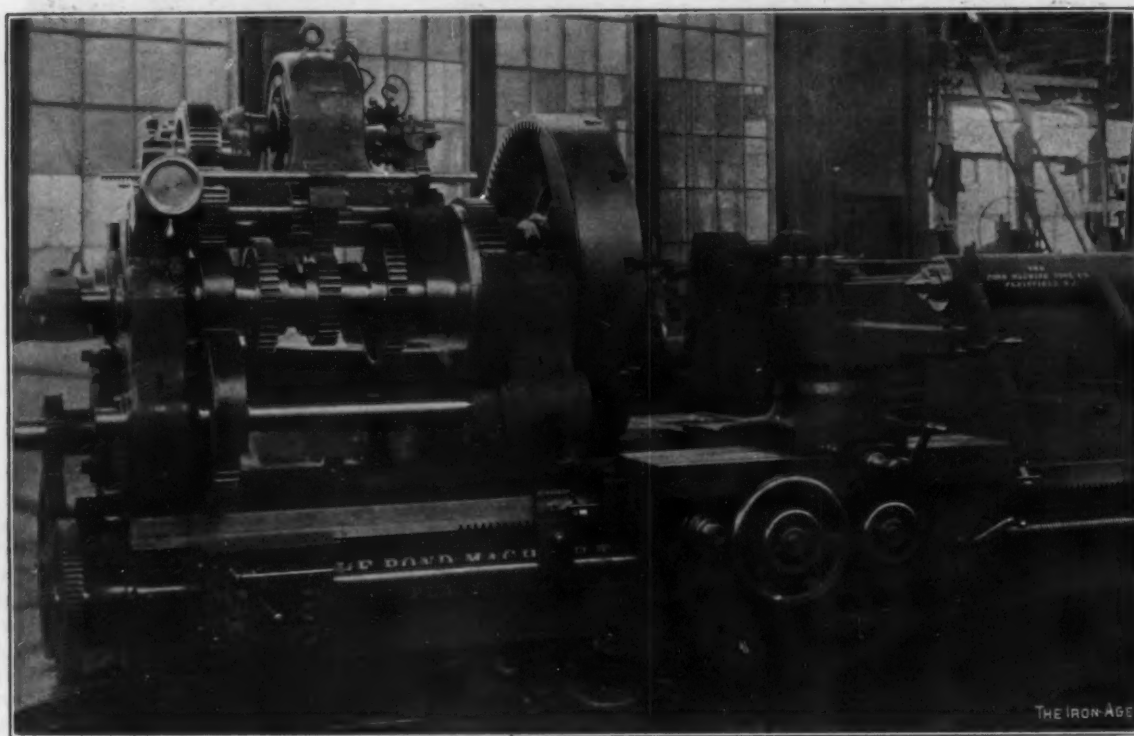


Fig. 4.—A 54-Inch Pond Lathe with $7\frac{1}{2}$ Horse-Power Westinghouse Motor, Furnished to the American Steel & Wire Company, Cleveland, Ohio.

rent motors are used the size and weight of the motor are dependent very largely on the minimum speed at which it is required to develop the full rated power. The size and weight of the electric motor increase as the minimum speed is lowered.

Motors and controllers for the three-wire two-voltage system are made by the General Electric Company for field regulation and rheostat control. Introducing resistance in the armature circuit by rheostats

ing the work as well as the tool. If the lathe is used for facing off work and the cut is continuous the inefficiency of this form of regulation is about the only objection.

The range of speeds is considerably smaller with field regulation than with rheostatic control, but the motor is operated at a higher efficiency and the velocity is constant at any particular speed.

There are two other systems of variable speed motors of interest, using armatures having two sets of coils and

two commutators. With the C and C system the slow speed is obtained by connecting the two armature windings in series, while for high speed these windings are connected in parallel. With the Commercial system it

ing the smaller number of turns in operation alone, the intermediate speed being obtained by cutting out the winding above mentioned and operating with that having the larger number of turns, while with the lowest

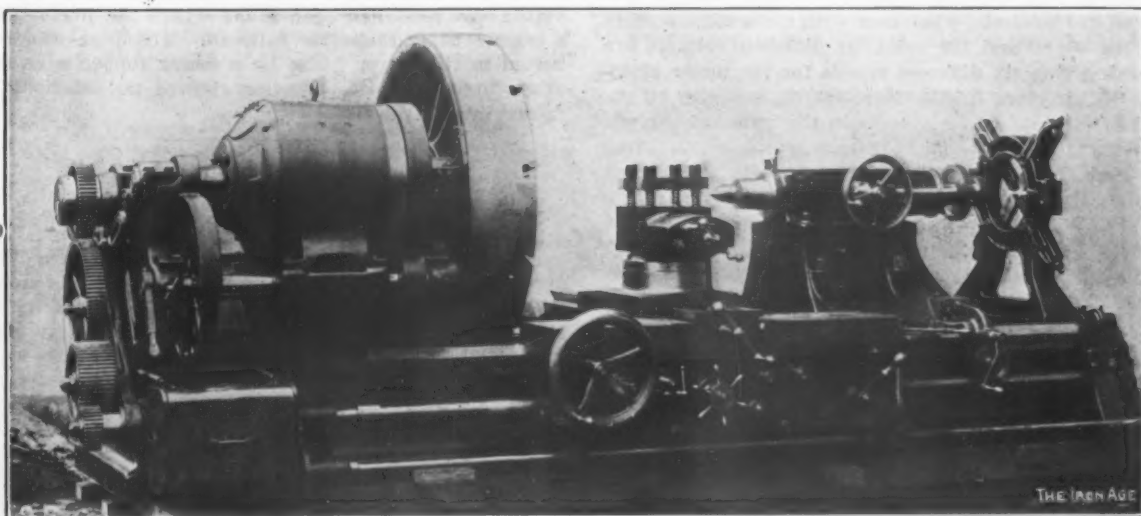


Fig. 5.—A 52-Inch Motor Driven Engine Lathe Built by the American Tool Works Company, Cincinnati, Ohio.

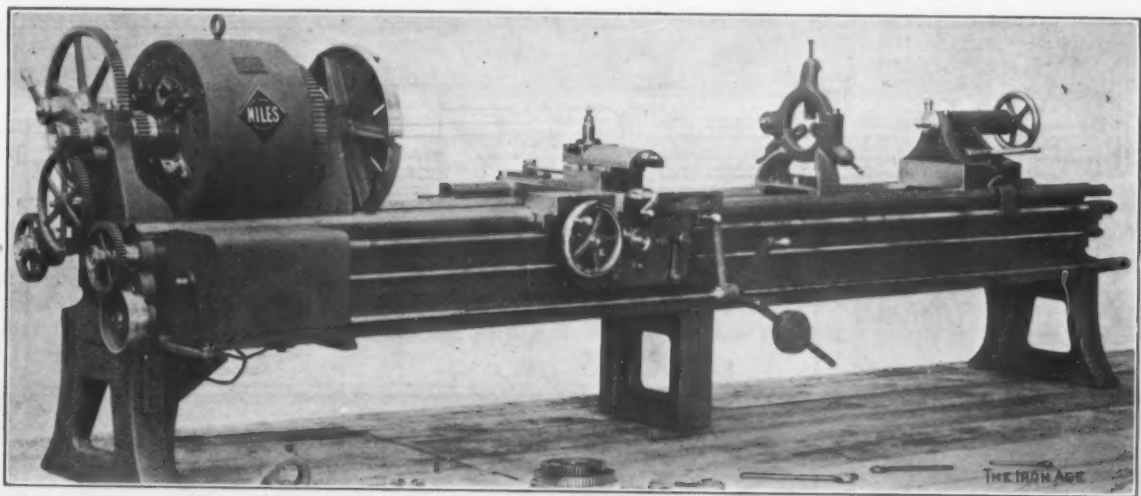


Fig. 6.—An Electrically Operated 22-Inch Engine Lathe Built by the Niles Tool Works of the Niles-Bement-Pond Company.

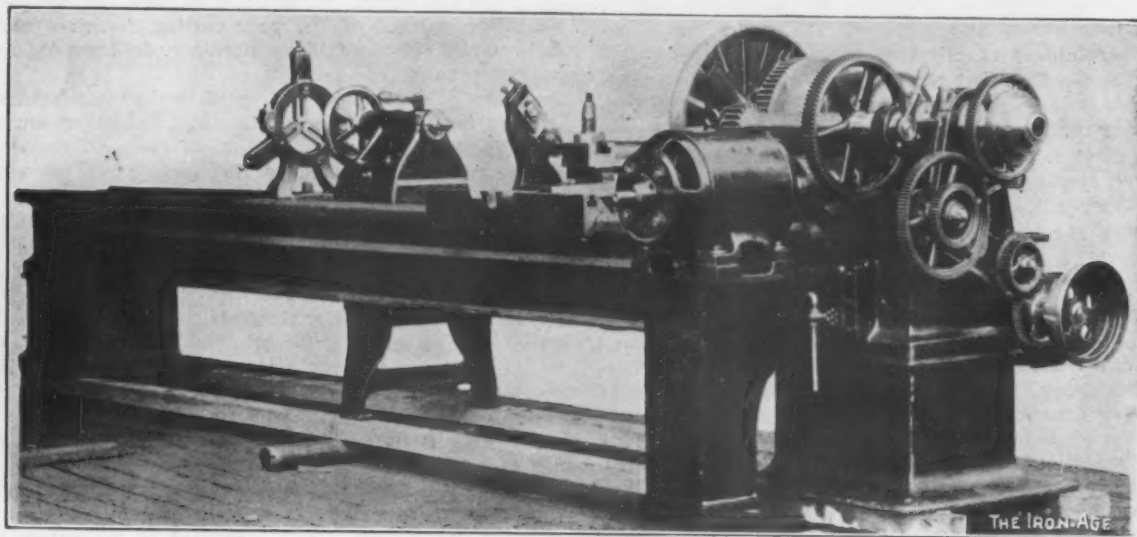


Fig. 7.—American Tool Works Company's 42-Inch Motor-Driven Triple-Gear Lathe.

is not necessary that the two windings on the armature have the same number of turns, as they are never connected in parallel. With this system one of the armature windings has a greater number of turns than the other, the highest speed being obtained with the winding hav-

ing the smaller number of turns in operation alone, the range of speeds being 2.5, 1.7 and 1. Several steps may also be obtained between the above combinations by field regulation, the total range being about 4 to 1 with 12 different speeds.

There are a number of three and four wire multi-voltage systems requiring balancing transformers, the speed being varied by controllers which vary the voltage of the current passing through the armature of the motor by making different connections with the feeding circuits. With the Crocker-Wheeler four-wire system using a generator of 240 volts and a balancer with three commutators supplying 40, 80 and 120 volts, six different voltages are obtained, giving six different speeds for the motor armature. Six or more intermediate speeds can also be obtained by introducing resistances in the armature circuit.

The two Bullock multi-voltage systems use four wires and three wires, the first giving six speeds and the latter three speeds, due to the different voltages supplied to the motor, while intermediate speeds are obtained by inserting resistance in the field circuit of the motor. On the three-wire multiple voltage system 90, 160 and 250 volts are used. The lowest voltage, 90, is large enough so that the drop does not materially affect the speed of this notch. The motor runs at normal speed at 250 volts, which is a suitable voltage for constant speed motors. If two steps of resistance are inserted between each pair of voltages and five steps after 250 volts is reached 12 steps are obtained in the forward direction and nine in the reverse direction. The 90 and 160 voltages are obtained from a two-machine

fact have quite the opposite effect, as tests have shown that a difference of potential exists between the ends of each insulated joint, which causes current to pass from one length of pipe to the next by way of the soil. Referring to the pipe lines from Camden to Trenton, N. J., Theodore Bunker stated that a difference of potential as high as 25 volts had been found where the line adjoins a poorly bonded electric railroad. The pipe was connected to the power house by a heavy copper wire, and after three years of operation showed no deterioration caused by electrolysis.

The R. D. Nuttall Company.

The large works of the R. D. Nuttall Company, Pittsburgh, Pa., are devoted to the manufacture of cut gears of every description. The building occupied is a six-story structure, having a floor space of 75,000 square feet, while the heavier machinery used in cutting large gears is contained in a one-story extension. The various shops are equipped with the latest machines and tools for the manufacture of cut gears, many of the tools being of special design. Among them is a uniquely constructed gear cutter, capable of cutting spur gears up to 30 feet in diameter by 60 inches face. With some minor changes it can be adjusted to cut gears of any diameter, limited

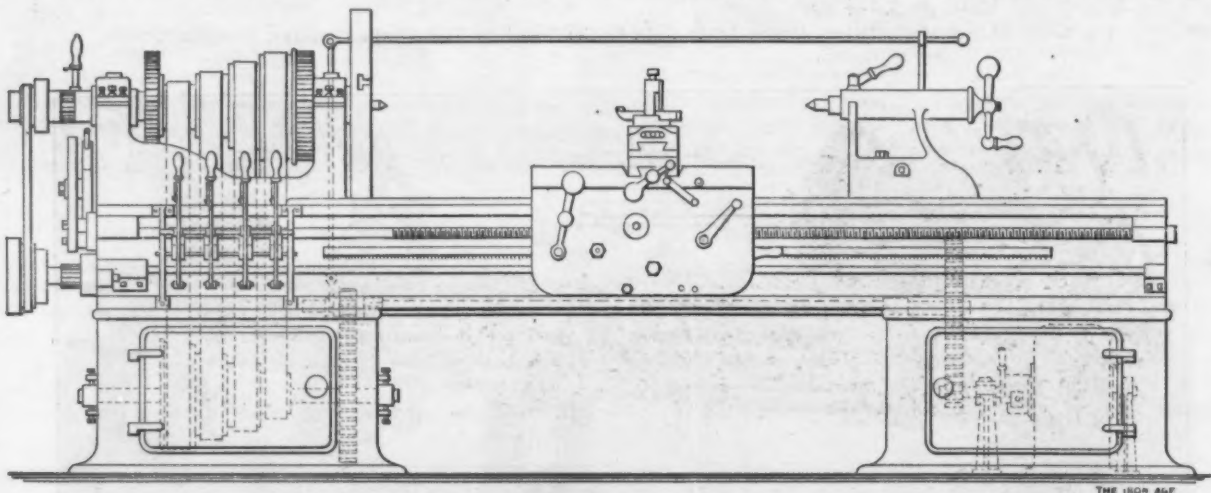


Fig. 8.—Westinghouse Induction Motor Driving a 24-Inch Engine Lathe Equipped with the Craft's System of Drive.

balancer having the two armatures connected in series across the 250-volt mains. The three-wire balancer consists of two machines for small unbalanced loads or two different types of machines for larger unbalanced loads, mounted on one subbase. The speed curves obtained are almost exactly true geometrical curves. This is due to the fact that the increase in speed from notch to notch is in a geometrical progression—that is, a constant per cent. increase—and not in arithmetical progression, where a constant number of revolutions is added on each step. It is claimed that the multiple voltage system lends itself admirably to existing installations, inasmuch as any motor can be used on this system merely by providing the necessary controllers and having a source supplying several different voltages.

Pipe Electrolysis.—At a recent meeting of the American Gas Light Association at Milwaukee, Wis., considerable discussion was given to the subject of electrolysis of gas pipes caused by nearby street railways. F. S. Richardson described experience with a six-mile pipe line paralleling a street railroad and connected with the trolley rail at five places near the center of the line in proximity to the power station. On account of damage done to the pipe before it was connected to the rail it was necessary a short time ago to remove about 600 feet. One length of pipe had 27 pits in it and three other lengths were so badly pitted that they leaked. Originally the pipe line had insulated joints every 500 feet, but it has since been bonded, making it a continuous conductor. A line free from insulated joints and bonded to the trolley rails wherever possible has proved to be the best. Insulated joints will not keep the pipe from being damaged, and in

only by available floor space. Other special machines cut worm gears up to 72 inches in diameter, spiral gears up to 50 inches in diameter, bevel and miter gears, internal gears and racks. In addition to these the equipment comprises upward of 100 gear cutting machines and a full complement of auxiliary machines, drill presses, forging presses, &c.

A special department is devoted to the manufacture of trolleys for street railway, mine and industrial haulage service. Another department, one of the most important in the works, is devoted to the manufacture of motor gears. Gear and pinions are made for every type of street railroad motors used in this and foreign countries and the business in this direction is constantly increasing. An order recently filled called for a number of large cut gears for cement work purposes, in which cast gears were formerly used almost exclusively. Large quantities of gears are also supplied for brick making machinery, and recently a large contract was taken for heavy gears and pinions for the Illinois Steel Company and a similar contract for an ore handling plant. The pattern department is located on the third and fourth floors and in it are stored over 6000 patterns.

The entire plant is electrically operated, power being furnished by four 125 horse-power Westinghouse three-cylinder gas engines direct connected to generators and one 85 horse-power belted gas engine. The company is at present employing over 200 men and is shipping its products to all parts of the world. The main offices are located in Pittsburgh and branch offices in Atlanta, Boston, Chicago, Cincinnati, Kansas City, Philadelphia and San Francisco. The officers of the company are: F. A. Estep, president and treasurer; J. R. McGinley, vice-president, and Milton Rupert, assistant to the president.

A Niles Electric Gantry Crane.

The 15-ton electric traveling gantry crane lately installed by the crane department of the Niles-Bement-Pond Company for the Illinois Steel Company, South Chicago, Ill., is illustrated in Figs. 1 and 2. It represents

connected together by diaphragm plates to prevent vibration. The A frames supporting the girders are of heavy structural steel construction, extending a sufficient distance above the top of the girders to enable the trolley to pass between the legs of the frames, which are rigidly connected together at the top. At the bottom the frames

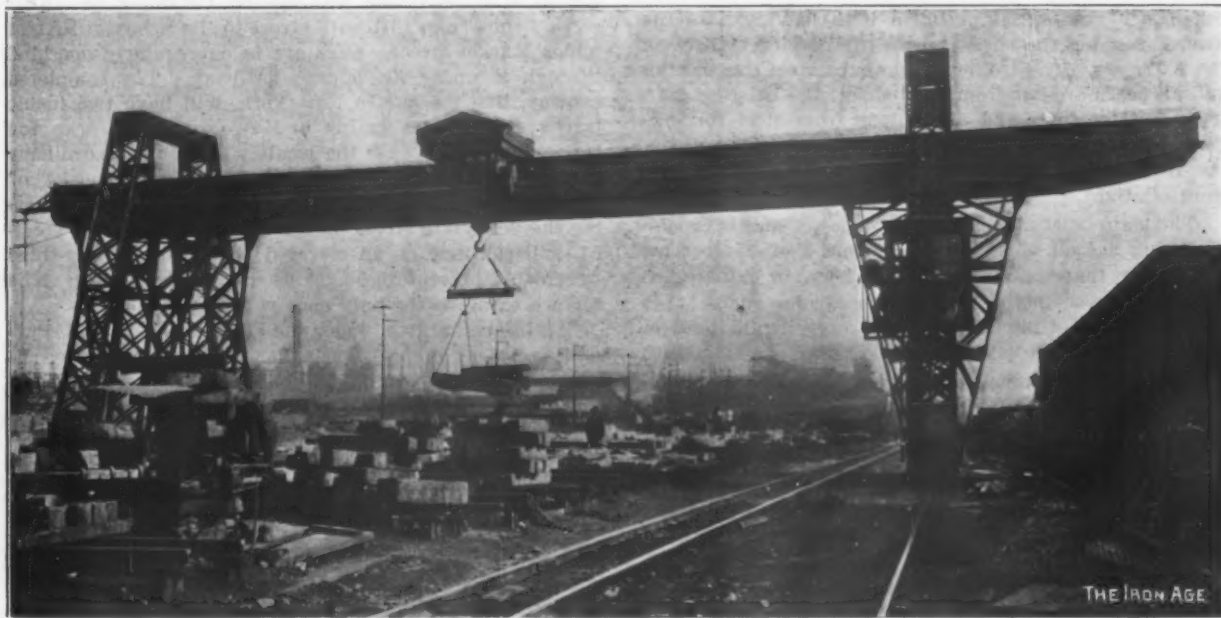


Fig. 1.—A 15-Ton Niles Electric Traveling Gantry Crane in the Yards of the Illinois Steel Company.

the type of crane used by the Illinois Company for yard service, and is employed principally for handling ingots and billets in the storage yard. This crane runs upon two single tracks, 70 feet center to center, and is equipped with a cantilever extension at each end, enabling the trolley to pass outside of the regular storage yard and

are attached to two heavy structural steel bridge trucks, each truck being equipped with four truck wheels attached to an equalizer oscillating on a pin. All of the wheels have double flanges.

The bridge motor is located approximately in the center of the girders, equidistant between the 70-foot



Fig. 2.—Another View of the Crane, Showing the Frame Construction More in Detail.

command the railroad tracks on either side, so that material can be unloaded from cars at either end of the crane and transferred to the central yard for storage. The total length of the crane is 104 feet.

The girders are of box section, the top and bottom chords being composed of universal mill plates and angles. The web plates are stiffened by vertical angles

tracks and is connected through gearing to the heavy bridge drive shaft, which is carried in adjustable bearings made in halves and babbitted. This motor is of 50 horse-power, or sufficient to move the entire crane when carrying its suspended load of 15 tons at a speed of 300 feet per minute, or when carrying no load at 375 feet per minute. Its power is transmitted to four of the

bridge truck wheels, two on each end being geared in unison to the bridge drive shaft. The latter is equipped with a powerful foot brake of the post type, controlled by a foot lever in the operator's cage, enabling him to promptly stop the crane without reversing the bridge motor. The operator's cage is inclosed to protect its occupant and the controlling apparatus from the weather.

To afford easy access to the bridge motor shaft and bearings a substantial platform with hand rail is furnished, running the entire length of the girders between the A frames. The trolley frame is of steel construction and all gears are cut from solid stock; the hoisting gears from steel castings and all pinions from steel forgings. The high speed gears are inclosed in cast iron cases and the trolley drive mechanism is also inclosed in a cast iron, oil tight, dust proof case.

The main hoist motor is 35 horse-power and is capable of lifting a load of 15 tons at a speed of 25 feet per minute, or the empty hook at 50 feet per minute. A $3\frac{1}{2}$ horse-power motor operates the trolley drive at a speed of 100 feet per minute when carrying 15 tons, or 125 feet per minute with the hook empty.

The shafts are turned and ground to exact diameter and revolve in babbitted cap bearings. The gears are forced on them by hydraulic pressure, and are further prevented from turning by straight feathers or keys. The trolley truck wheels are double flanged, the axles revolving in half bronze bearings with M. C. B. waste cellars beneath.

The hoisting mechanism is equipped with a powerful mechanical brake of the coil type submerged in oil. The armature shaft of the hoist motor is equipped with a powerful electric brake of the Western disk type, with hard bronze and steel wearing surfaces in accordance with the Niles standard construction. The drum is turned to receive the full length of the rope without overlapping and the hoisting mechanism is equipped with a positive limit switch connected to a double pole I. T. E. circuit breaker, located in the cage on a slate switchboard. To prevent the bottom block from overhauling this double pole circuit breaker acts as a main switch.

The entire trolley is inclosed for outside service. The cantilever extends 21 feet beyond the A frame on the one side and 8 feet on the opposite end, giving a maximum travel to the trolley of 104 feet, so that the load can be lifted from a car coming under the cantilever extension on the one end and deposited on a car under the cantilever extension on the opposite end without interfering with the stock between the 70-foot tracks. The travel of the crane in the yard is limited only by the length of the track prepared for it, and at present is about 1000 feet long. The total weight of the crane is approximately 142,500 pounds.

The current for operating the crane is taken from overhead-wires at one end of the cantilever through stranded rubber covered conductor cable, packed with jute, taped and braided, to the cage, where it is distributed through the controllers to the various motors. These controllers are situated in the rear of the cage and are operated by the levers in the front. The cage is equipped with large drop windows which can be opened and closed, and a steel ladder extends from the cage to the platform. A number of incandescent lights are arranged along the bottom of the girders to enable the crane to be operated at night.

New Open Hearth Furnaces in New Jersey.—Three 20-ton open hearth steel furnaces are to be built by Benjamin Atha & Co., to be operated in connection with their steel casting plant at the foot of Chapel street, Newark, N. J. The contract for the furnaces has been awarded to the S. R. Smyth Company, contractor and engineer, Pittsburgh, Pa. The building will be erected by the American Concrete Steel Company. Work on the additions will be rushed and it is expected that it will be completed this winter. The Crucible Steel Company is also expecting to add two or more furnaces to its Atha plant at Harrison, N. J., proposing to utilize the furnaces to dispose of its scrap. It is understood that the

improvements will be begun very shortly and will be completed during the winter.

Philadelphia's New Subway.

The first section of the underground electric road which the Philadelphia Rapid Transit Company has in course of construction was opened December 18. This section runs from Fifteenth street to the Schuylkill River under Market street. Cars are being regularly operated through it under five-minute headway. The completed subway, like the one in New York, will have two inside tracks for express trains and two outside tracks for locals, but in this case the locals will be of the ordinary surface car form. The express trains will consist of all steel cars, which, after leaving the subway and crossing the Schuylkill River over a new bridge recently erected, will continue on an elevated structure to Sixty-third street. At present these trains are not in service. The surface cars are the only ones yet in operation.

An inspection trip, under the guidance of John B. Parsons, president of the Transit Company, was made December 16 by about 500 men prominent in street railroad work, including engineers, managers, city officials and others, and a general invitation was given to the public to inspect the subway on December 17. It was estimated that on the latter occasion about 50,000 people were admitted.

The completed section of the subway is 48 feet 6 inches wide inside and 14 feet 6 inches above the rails. The roof is supported by three lines of columns and is formed of concrete arches supported on steel I-beams on 5-foot centers. The side walls are of reinforced concrete and the floor is of plain concrete. Conduits for feeders and lighting wires are embedded in the south wall. The outside of the walls is water proofed and drains are provided to take care of leaks or floods. At Twenty-second street a well collects the drainage, which is emptied into the sewer by automatically regulated electric centrifugal pumps.

The stations at present open are located at Fifteenth street, Nineteenth street and at the east end of the Schuylkill Bridge, near Twenty-fourth street. The latter station is to be connected with the Baltimore & Ohio Railroad station. Electrically the subway is divided into half-mile sections. The lighting and power circuits are entirely separate and provision is made whereby lamps can be connected if necessary in groups of five on the power circuit. The regular lighting supply on 110-volt circuits is taken through transformers located in each station. The current from each station is distributed to the lamps half way to the next station on either side.

An interesting type of track construction is used, having no ballast, for the purpose of providing a perfectly sanitary condition. The entire roadbed can be washed down with a hose and drained through sumps placed at frequent intervals. The rails for the local tracks are mounted on cast iron chairs, which with the rails are embedded in concrete. The rails are secured to the chairs by adjusting screws, making it possible to set the rails to exact gauge. Except at crossovers, the express tracks are mounted on yellow pine blocks, to which they are attached by clips and screw spikes. One rail for each express track has been reserved for block signaling, the other rail is bonded with a protected bond and the two return rails are cross bonded.

As surface trolley cars will be operated over the local tracks an overhead wire is provided, supported in a special flexible suspension. The express tracks and elevated structure will be equipped with the third rail eventually, but for the present trolley wire will be used for the surface cars, which will be operated until the elevated structure is finished.

Profiting by the experience with the New York subway, special consideration has been given to ventilating. In addition to the openings at the different passenger stations there will be special chambers connected to stacks outside. It is expected that the natural draft will be sufficient, but arrangements have been made for the future installation of fans at the base of any of the stacks if necessary.

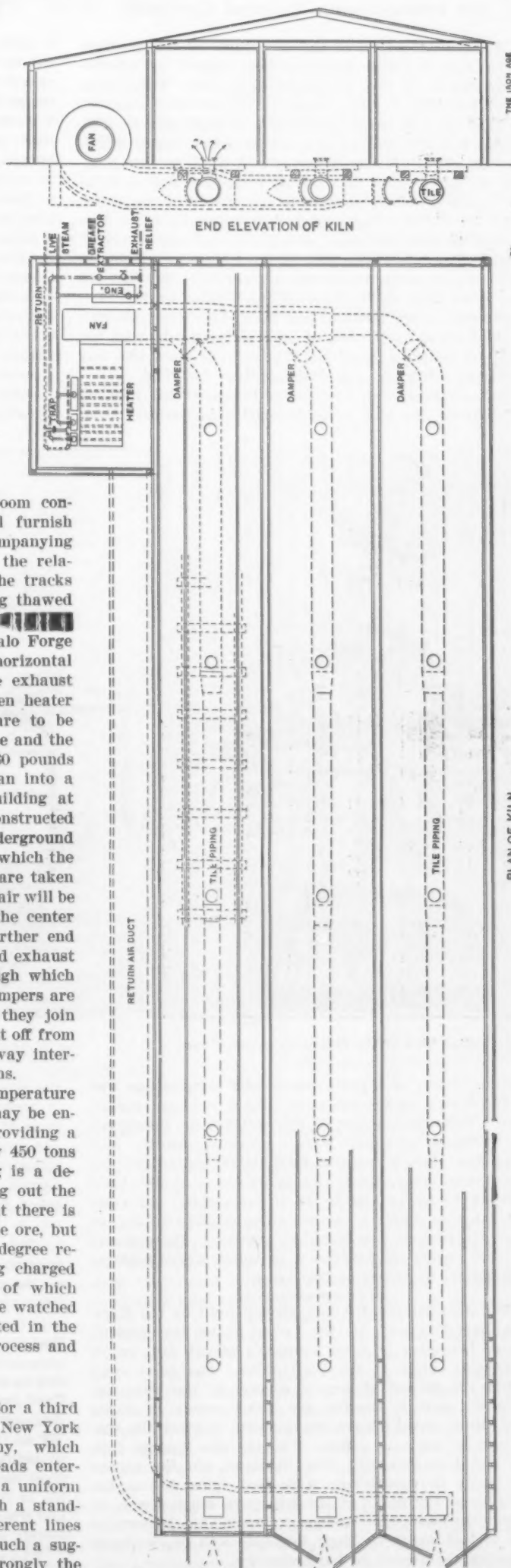
Ore Thawing Apparatus.

The Zenith Furnace Company, Duluth, Minn., has just completed a new ore thawing plant, the design of which is of particular interest, inasmuch as the system adopted has distinct advantages over the methods for thawing ore previously used. The iron ore is brought to the plant in cars equipped with drop bottom doors and during the winter months difficulty is experienced because of its freezing solid, making it impossible to dump the ore from the cars or even to open the doors. The building used for thawing the ore is a frame structure 140 feet long by 40 feet wide and 12 feet high above the tracks and is divided lengthwise into three compartments, each designed to accommodate five cars loaded with ore. The outside walls as well as the ceiling and the partitions between the three compartments are sheathed inside and outside with double boards with a layer of felt between the boards. In the construction of the kilns every precaution has been taken to make them tight. Adjoining the building at one side at the end is a small room containing the fan system apparatus which will furnish the hot air for thawing the ore. The accompanying plan and end elevation of the building show the relation of the several parts of the system and the tracks on which the cars stand while the ore is being thawed out.

The entire plant was furnished by the Buffalo Forge Company, Buffalo, N. Y., and comprises a horizontal engine direct connected to a large steel plate exhaust fan which draws the air through a bank of ten heater coils. The first two sections of the heater are to be supplied with exhaust steam from the fan engine and the remaining eight sections with live steam at 60 pounds pressure. The hot air is discharged by the fan into a main brick duct running crosswise of the building at one end. From this main duct branch ducts constructed of tile piping lead into each kiln, running underground directly underneath the middle of the tracks on which the cars are set. From these branch pipes outlets are taken off, one under the center of each car, so that the air will be delivered vertically at a point directly below the center of the cars and against the doors. At the further end of the kilns, near the entrance doors, are located exhaust openings leading down into a brick duct through which the air is returned to the apparatus room. Dampers are provided in the main hot air branches where they join the main hot air duct, so that the air can be shut off from any one or more of the kilns without in any way interfering with the operation of the remaining kilns.

The apparatus is designed to maintain a temperature in the kilns such that the ore in the 15 cars may be entirely thawed out in the course of 20 hours, providing a daily capacity of 15 carloads, or approximately 450 tons or ore per day. This method of ore thawing is a departure from the ordinary method of steaming out the frost and presents not only the advantage that there is a considerable saving in the cost of thawing the ore, but at the same time the moisture is to a certain degree removed from the ore instead of the ore being charged with an additional amount of moisture, all of which must be evaporated later on. The plant will be watched with great interest by parties directly interested in the thawing of ore and familiar with the usual process and its attendant difficulties and disadvantages.

A standard third rail, or standard position for a third rail contact surface, has been suggested by the New York Central & Hudson River Railroad Company, which has initiated a movement to induce the railroads entering New York and Jersey City to decide upon a uniform standard for third rail location. Without such a standard, interchange of rolling stock between different lines in an emergency, would be impossible. That such a suggestion as this should be made emphasizes strongly the advance of electric propulsion on steam railroads.



Plan of Ore Thawing Plant of the Zenith Furnace Company, Duluth, Minn.

The Pennsylvania Railroad Company.

A financial review of the operations of the Pennsylvania Railroad Company has been issued by Charles Minzesheimer & Co., 24 Broad street, New York, from which the following interesting statements are taken:

This great railroad system had its beginning in 1846, so that it has had a life of nearly 60 years, during which time its growth has been steady and equal to that progress by this country in material respects which is without a precedent or a parallel in the history of the world. With its 10,918 miles owned and controlled there was carried in 1904 one-sixth of all the railroad travel of this country and one-quarter of the freight. Gross earnings were one-eighth and the net earnings the same of the entire railroad systems of the United States. Receipts from other sources than operations were one-fifth of the total of the balance of all other railroads, with the total expenditures one-sixth. The mileage since 1850 has increased thirtyfold and gross earnings fortyfold.

It carried a cash balance on December 31, 1904, of \$35,000,000. Not only is the Pennsylvania Railroad Com-

The Eberhardt Crank Shaper.

The crank shaper, which represents the latest product of the Eberhardt Brothers Machine Company, Newark, N. J., is one intended both for general manufacturing and for tool room use. The tool, shown in Figs. 1 and 2, embodies a number of special features that have as their object accuracy and high producing capacity, and special attention has been given to the details which add to the convenience of the operator.

One new feature is seen in the manner of guiding the ram by the use of vertically guiding V's, like the V's of a planer or lathe. The V has the advantage of guiding the ram in a rectilinear path, tending to wear itself continuously in alignment with the added advantage of increased rigidity of the ram and frame under the working strains. The advantages of the square ram guides are combined with the accuracy obtained with the planer V's, while increased rigidity and absence of side play are gained.

The V's being vertical, as may be seen by the line drawing, Fig. 3, secure an accuracy in the alignment of

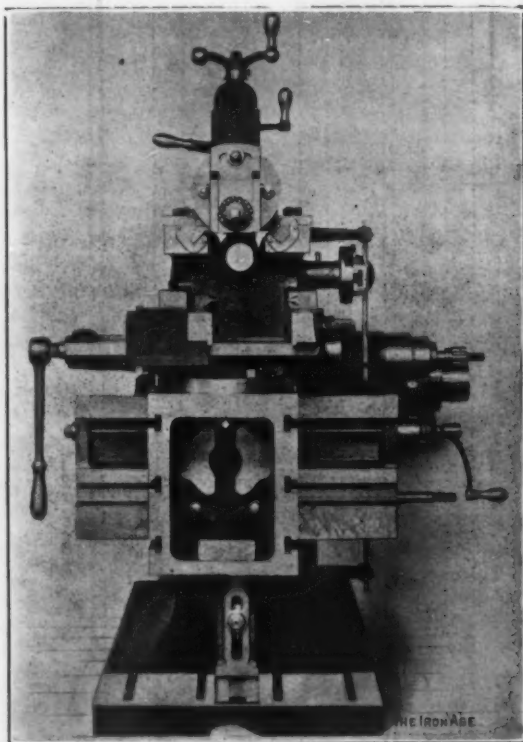


Fig. 1.—End View of the Eberhardt Crank Shaper.

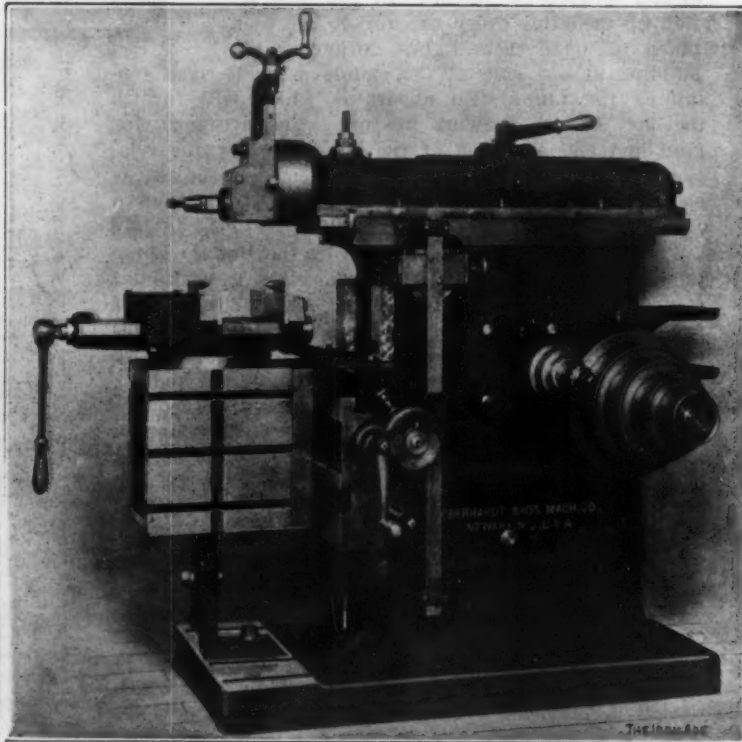


Fig. 2.—Side View, Showing the Unique Feeding Mechanism.

pany the center of a great system—150 corporations east of Pittsburgh alone—but it is also a holding concern. With a total bonded debt of \$186,000,000, the Pennsylvania Railroad Company, which operates directly 3748 miles, has a stock issue of \$400,000,000 authorized, but only three-fourths issued. Under its report of 1904 there were owned stocks and bonds of \$314,000,000 par value and listed as assets at a cost value of \$219,581,161, on which the revenue was about 4½ per cent. These securities thus owned are believed to be worth \$390,000,000, or \$170,000,000 in excess of their cost.

The steel floating dry dock Dewey, built by the Maryland Steel Company for the United States Government, started December 28 from Solomon's Island, Md., on its 14,000-mile cruise to the Philippines. The great craft will be the subject of deepest concern to the Navy Department until it reaches the quiet waters of Subig Bay. Many naval officers are doubtful whether the voyage can be made in safety. The Havana floating dock was towed to that port from Scotland, but the voyage was short in comparison with that lying before the Dewey, and the perils of the trip were much fewer, as there were more opportunities to make safe harbors in case of bad weather. Four towboats will be employed in taking the Dewey to its destination.

the ram not obtainable in any other manner. The tool is perfectly guided when taking finishing cuts, as the form of the guides eliminates the tendency to side play and looseness found in other styles of ram guides, even though they be adjusted as closely as free running will permit. The heavy strain of a roughing cut is directly taken by the broad flat straps, the pressure being normal to the straps.

This method of guiding the ram also avoids any tendency to spread the frame or buckle the ram, which is one of the disadvantages of the square or dove tailed methods of guiding the ram when taking roughing or heavy side cuts and is the only method of guiding the ram so that the strains resulting from the cut are local and not transmitted through the ram or frame of the machine. It can be seen by the line drawing that the strains are confined between each strap and the V's, there being no wedging or strain between the V's on one side and the V's on the other side of the machine. It has been found by actual use and experience in taking heavy side cuts in steel that the rigidity of the ram and absence of chattering is remarkable. The V's tend to wear in alignment, and when necessary the wear is conveniently taken up by merely adjusting the flat straps.

The stroke is a positive crank motion and is instantly

adjustable in length, without the danger of slipping or running away. The length of stroke at which the machine is set is always exactly indicated by a stationary graduated index by means of which the machine can be set at any desired length of stroke either before the machine is started or while it is running. This is claimed to be the only machine in which the operator can set the length of stroke suited for the work while he is setting the work, without starting the machine and in whatever position the ram may be. The position of the ram may also be changed to suit the location of the work by a positive screw adjustment, either while the machine is running or at rest.

The machine is made in either the single geared or the backed geared styles. In the latter a double train of gearing is used with a double bull wheel. Although this feature is not new, it has not been adopted in general on shapers. It costs perhaps a little more than the usual arrangement of back gearing, but has many advantages. By it the cutting power and cutting speeds may be conveniently adjusted to suit various grades of work and material without high rotating speeds of shafts and gears on short strokes, which are common in other methods of back gearing. The cone pulley runs upon its own bearing and not upon the pinion shaft, thus relieving the shaft of all strain of the belt. The pinion shaft has a squared end fitting loosely in a square hole in the driving pulley. This same driving feature was incorporated in the Eberhardt No. 1 gear cutting machine, described in *The Iron Age* November 23, 1905.

The box table is of the universal type, which may be swiveled in a complete circle. Any side of the box may thus be used as a working side, the box being rigidly held in any desired position. The vise is graduated, swivels to any angle and is so constructed that the jaws are drawn together and not pushed together, thus subjecting the screw to no compression strain. This has the advantage of holding the work down more firmly, without straining the body of the vise. The method of holding the vise to the table is such that all adjustments are made from the top of the table for the convenience of the operator.

The traverse feed mechanism is operated through a vertical reciprocating rod. The feed is variable and may be changed instantly when the machine is running or at rest. The movements and convenient location of this part have been carefully studied, with the result that the danger to the operator's fingers is eliminated. There are no rapidly oscillating or revolving parts to be adjusted. The feed stops automatically at each end of the traverse and also automatically adjusts itself to any elevation of the cross rail without requiring any attention.

The machine is provided with an extension base and an outside support for the table, the supporting foot being conveniently adjustable. This foot is also reversible, so that the short leg may be placed vertically when the table is in a very low position.

The usual hole is provided under the ram to admit a shaft in which a key seat is to be cut.

To sum its advantages, the machine as a whole is so designed that the operator may set the work accurately and securely, set the exact length of stroke required, position the ram and set the feed, without starting the machine, and if it is desired to make any of the adjustments after the machine is running they may be made as conveniently as when the machine is at rest.

Exhaust Steam Turbines.—One important conclusion has been reached since the recent installation of a steam turbine using exhaust steam at one of the stations of the Philadelphia Rapid Transit Company. This is, that

it is more economical to utilize exhaust steam from reciprocating engines in steam turbines than to run the engines condensing. In the station referred to there are four 1500 horse-power and one 2200 horse-power Wetherill-Corliss engines, which have always been run non-condensing because of a scarcity of cooling water. The new turbine is of 800-kw. capacity, Curtis type, and has been installed in connection with an Alberger cooling tower. The steam, as received from the exhaust main of the reciprocating engines, is at a pressure very little, if any, above the atmosphere. The average vacuum on the turbine exhaust is 28 inches, and it is obtained at an expenditure of about 115 horse-power for driving the auxiliaries, including the rotary pumps circulating the cooling water in the tower. The turbine develops about

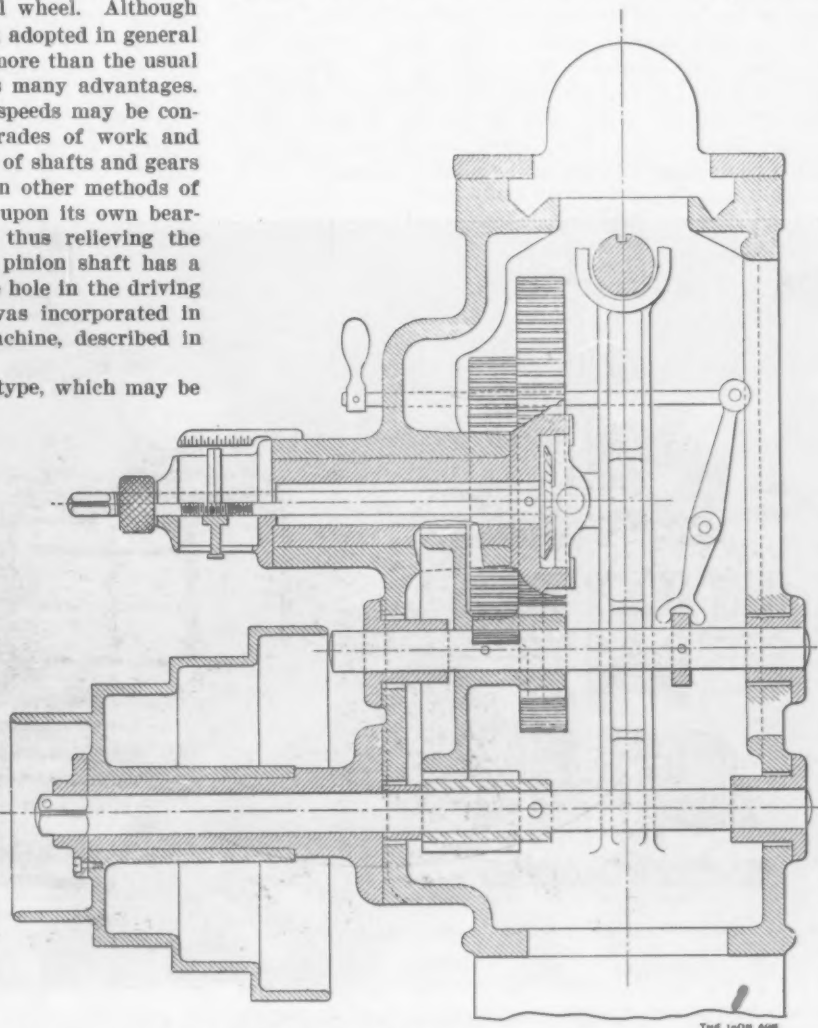


Fig. 3.—Sectional View of the Eberhardt Crank Shaper.

1,000 horse-power. Deducting from this the 115 horse-power required by the auxiliaries leaves a total gain of 885 horse-power to the credit of the turbine. This represents an increase of 57½ per cent. in the power realized over that obtained from the reciprocating unit alone, with the same amount of steam. It is more than double the gain that could have been obtained had a condensing equipment been installed in connection with the engines.

Although there are a number of express locomotives in the United States whose heating surface (a fair index power) exceeds 3000 square feet, the most powerful in Great Britain has a surface of only 2514 feet, this being a new four-cylinder balanced compound engine on the Great Northern. The cylinders measure respectively 14 and 23 inches in diameter, with a common stroke of 26 inches. The drivers have a diameter of 80 inches. The boiler tubes, which number 149, are of the Serre type, with internally projecting longitudinal spiral ribs, and are 2¾ inches in outside diameter and 12 feet 4 inches long. The boiler has a diameter of 61½ inches, with a plate thickness of 11-16 inch. The working pressure is 200 pounds per square inch. This engine weighs, without tender, 80 tons.

The Central Iron and Steel Company's Plate Mills at Harrisburg, Pa.

The plate mills of the Central Iron & Steel Company, at Harrisburg, Pa., with their 53 years of history, are an example of the persistent development of a single line of finished product through all the years that have led up to the present era of great consolidations with a wide diversification of output. The Harrisburg company represents also the evolution by which a producer of finished material dependent upon others for its steel at length becomes its own steel manufacturer, the producer of its own pig iron and the miner of its own ore. Ownership of ore property being the latest step in this evolution, mention may be made of that first. Within the past year the company, in conjunction with Pickands, Mather & Co., Cleveland, Ohio, has formed the Mohawk Mining Company, which will operate the Mohawk mine on the Mesaba range. The Central Iron & Steel Company has a controlling interest in the mining company, which

other interests entered into the consolidation which bears the present company's name. The original mill was built at the foot of Herr street, in the northern part of Harrisburg, and on the other side of the city from the site of to-day. Ground was broken in September, 1852, and boiler plate was first made in April, 1853. After some years the original mill was succeeded by what was known as the Herr street puddling and rolling mill, built adjoining its predecessor. In 1878 the rolling of plates was carried to South Harrisburg, where the present works are located and the Herr street plant was continued as a puddle mill. The first mill was built and started by Charles L. Bailey, who had associated with him Morris Patterson as special partner. The entire capital at first was \$25,000. In 1854 George Bailey, brother of Charles L. Bailey, was admitted to the firm and the capital was increased to \$50,000. The product in the early days consisted entirely

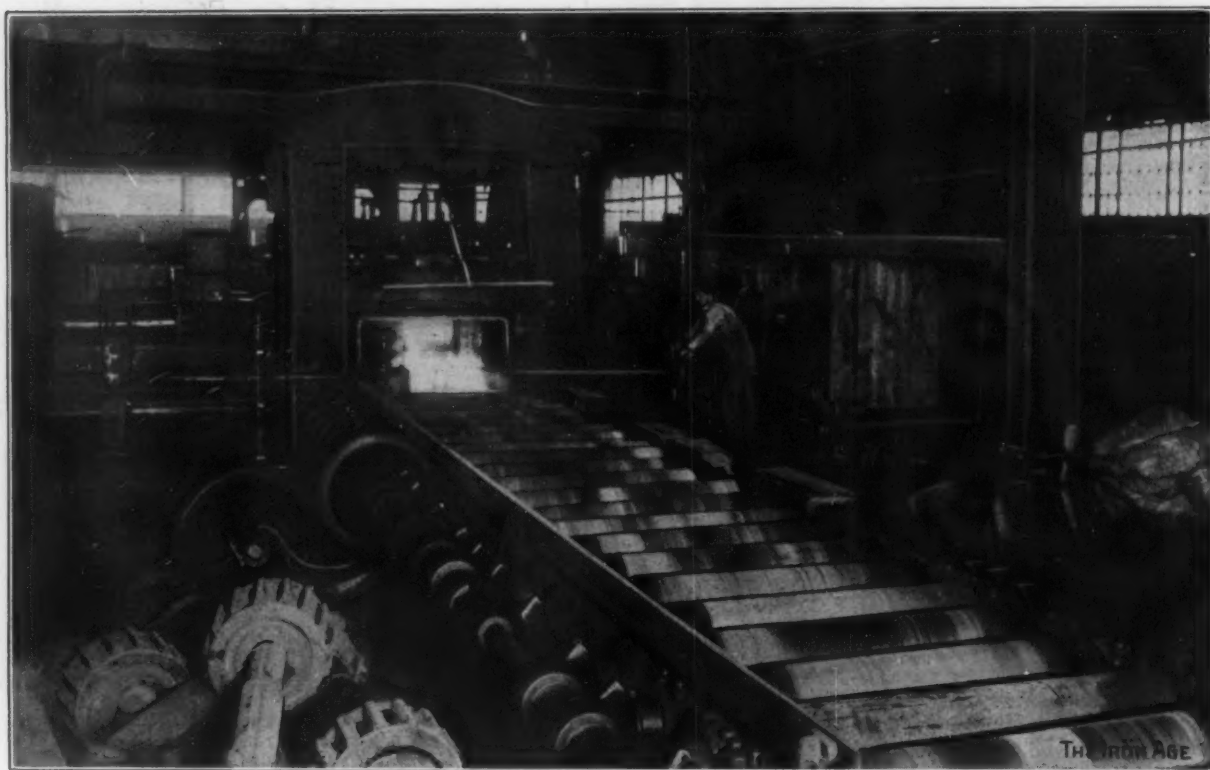


Fig. 1.—The Universal Mill of the Central Iron & Steel Company, Harrisburg, Pa.

has under lease the northeast one-quarter of the southwest one-quarter of section 4, T 58 north, R 15 west, St. Louis County, Minn. The Mohawk adjoins the Miller mine of the La Belle Iron Works. Its ore is non-Bessemer and adapted to the manufacture of basic iron. The shaft has been sunk, the machinery installed and the mine opened. The Mohawk will be a shipper in 1906 at the rate of 200,000 tons a year and on that basis has sufficient ore in sight to last 15 or 20 years. The other steps taken by the company toward a self contained position were the erection of an open hearth steel plant in 1903 and 1904 and the acquisition of blast furnaces in 1902.

It is worthy of note that in eastern Pennsylvania three companies engaged exclusively in the production of plates represent about 25 per cent. of the plate producing capacity of the country. In the case of each of these three, plates have been the original product, and all represent through their predecessors some of the oldest rolling mills in the country, one dating back to 1810, another to 1838 and the works at Harrisburg to 1852.

Beginnings in the Fifties.

The Central Iron Works represented the starting point of the present establishment, though, as will appear later,

of the best charcoal iron plates, suitable for boiler work, and the output was but 1000 tons a year. Later the company took up the manufacture of tank plate and by 1856 had increased its output to 2500 tons a year. Thirty men were employed at the start and this number was increased to 50 in 1856.

The rolls of the first set were 60 inches in length and the plates sheared out at the most 1200 pounds. They varied in thickness from $\frac{1}{4}$ to $\frac{3}{4}$ inch. Charcoal blooms were bought principally from the forges in the Cumberland Valley, Pa., and ranged in price from \$65 to \$75 in war times, when all values went to high levels. For many years the Central Iron Works made all the fire box and locomotive boiler iron used by Richard Morris & Son of Philadelphia; they also sold largely to N. W. Baldwin & Co., the founders of the Baldwin Locomotive Works. The product of the Central Iron Works was largely sold in the general trade throughout the East and as far West as Chicago, these plates coming to be known as "Bailey's Iron," and as such are still in demand.

Formation of the Consolidated Company.

The Central Iron & Steel Company was formed in May, 1897, by the consolidation of the Central Iron

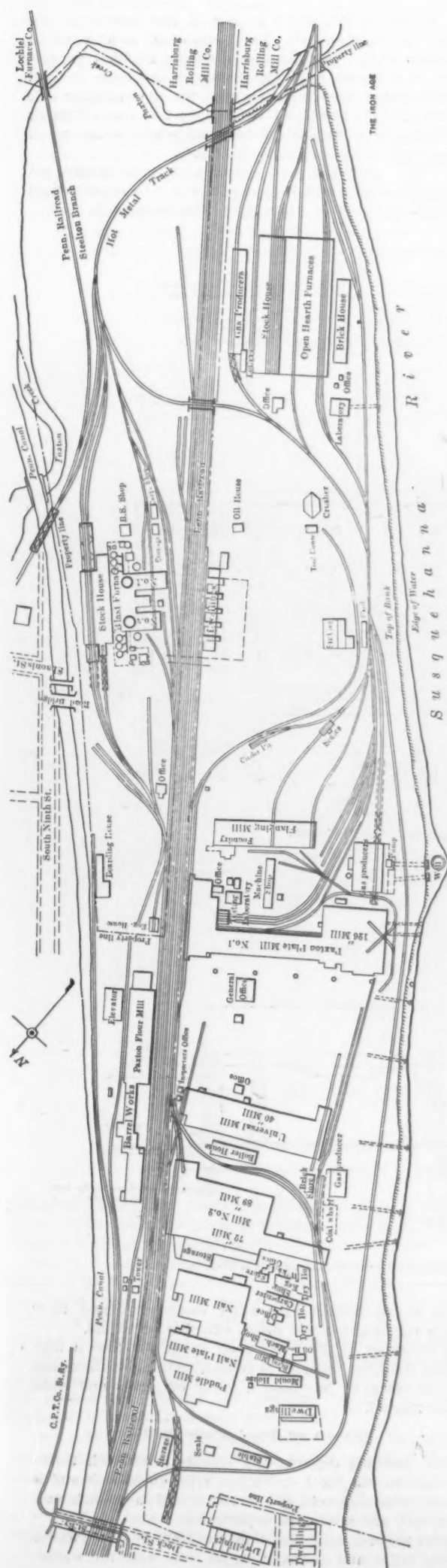


Fig. 2.—Plan View of the Central Iron & Steel Company's Plant at Harrisburg, Pa.

Works, Paxton Rolling Mills and Charles L. Bailey & Co., Incorporated. The Central Iron Works had had a steady growth, until at the time of the merger its product had reached 90,000 tons a year. The Paxton Rolling Mills were built in 1869 by the estate of James McCormick, and were under the direction and management of the late Col. Henry McCormick, with John Q. Denny as superintendent. The firm had developed its plate mill operations from a product of 2500 tons in 1869 to 60,000 tons in 1897. In 1893 it had built a 126-inch plate mill, which at the time was the largest in the country. It is known as the "Paxton" mill of the Central Iron & Steel Company plant. The third member of the consolidation, Charles L. Bailey & Co., had been engaged in the manufacture of cut nails since 1867, the plant having been built by Charles L. Bailey. The product was muck bars as well as cut nails. The Chesapeake brand of nails made by this company has long been well known in the United States as well as in foreign countries. The puddle mill and nail plate and nail mills of the Chesapeake Nail Works are shown in the general plan view in Fig. 2, but these works are operated under lease by Charles L. Bailey & Co., Incorporated.

The Blast Furnaces.

About 72 acres are covered with the blast furnaces, steel works, plate mills and the subsidiary puddling and nail plants. The track system has a total length of 7 miles and connections are made with the Pennsylvania Railroad, the tracks of which run through the property its entire length, and also with the Reading Railroad. The western line of the steel company's land is made by the Susquehanna River.

Taking the plant up in the logical order, the blast furnaces are to be noticed first. The two stacks, which are shown in Fig. 2, in the northeastern portion of the property on the opposite side of the Pennsylvania tracks from the open hearth and finishing departments, were acquired by purchase from the Paxton Iron & Steel Company in May, 1902. No. 1 furnace is 75 feet high, with 9-foot hearth, 14-foot bosh, 10-foot stock line and 6-foot bell. There are two 18 x 50 foot and one 18 x 60 foot Whitwell stoves. No. 2 furnace is 80 feet high and has a 9½-foot hearth, 14-foot bosh, 10-foot stock line and 6-foot bell. Each furnace receives blast through 10 tuyeres. No. 2 furnace has three 18 x 60 foot Whitwell stoves, which were the second set of fire-brick stoves installed in the United States. For No. 1 furnace there are one 400 horse-power Wheeler and two 200 horse-power Babcock & Wilcox boilers, and for No. 2 furnace one 400 horse-power and one 300 horse-power Wheeler and two 250 horse-power Babcock & Wilcox boilers. The blowing engines are of the Welmer type, that of No. 1 furnace having a 42-inch steam and a 90-inch air cylinder with 48-inch stroke, while the No. 2 engine has 50-inch steam and 96-inch air cylinder and 60-inch stroke. The average output of No. 1 furnace has been 135 tons a day and of No. 2 furnace 155 tons a day of basic iron, a portion of this product being sold on the market. For the taking of direct metal to the open hearth furnaces a track will be laid and a bridge provided over the Pennsylvania tracks, as indicated in Fig. 2, but at present cold pig iron is charged. The use of 94 per cent. of Mesaba ores, the remaining 6 per cent. of the burden being heating furnace cinder, has been accomplished without the top explosions once common with such a large proportion of fine ores. Flue dust is less than 2 per cent. of the weight of ore and the actual yield of pig iron averages but 1 per cent. less than the theoretical yield of the ore mixture in pig iron. Over a considerable period the amount of "off" iron has been less than 2 per cent. of the iron made. At present bottom filling and top filling are by hand labor, but a bin system is included in plans for the future. Frank F. Amsden is superintendent of the furnaces.

Open Hearth Furnaces.

Work on four 50-ton basic open hearth furnaces was begun in 1903 and the first heat was poured in June, 1904. This plant was designed by Niven McConnell and is the sixth plant built by him. It represents the accumulated experience of its designer and the progress made in open hearth furnace construction in recent

years, the result being a gratifying efficiency in operation. The furnaces are in charge of P. D. Cameron, who was associated with Mr. McConnell at the Sharon Steel Company's plant. The construction work was immediately in charge of H. G. Taylor, representing the designer, and Mr. Taylor is now connected with the Central Iron & Steel Company as engineer. The open hearth building is 304 feet long. On the pit or casting side the width is exceptional, the distance from center to center of the crane runway being 58 feet, giving ample room for railroad tracks, molds, ingot tracks and

The ingots, as shown in Fig. 7, are cast in groups and are bottom poured. The ladle crane is of 100 tons capacity, of the Wellman patent double trolley type, and there is a 25-ton auxiliary trolley. The ladle is built throughout of open hearth steel. On the charging side the equipment consists of a Wellman low type charging machine and a Wellman 40-ton double trolley hot metal crane with 10-ton auxiliary trolley.

The gas producer plant consists of 16 producers, the construction of which is shown in Fig. 5, a cross section through the valves, flues, &c. The producers have a

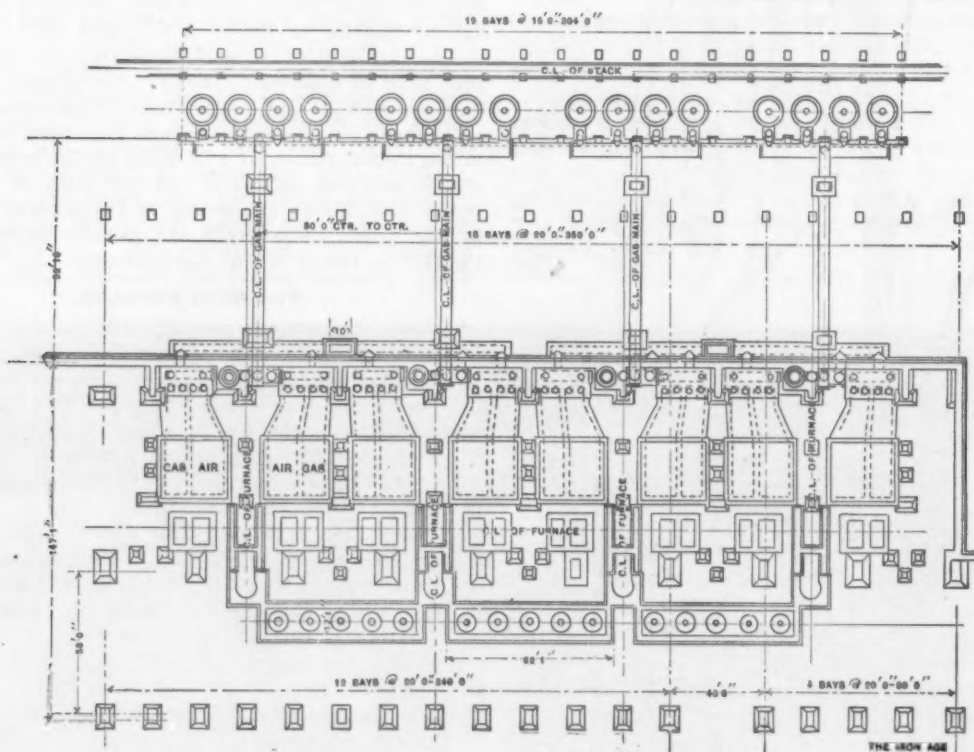


Fig. 3.—Plan of Open Hearth Furnaces and Gas Producers.

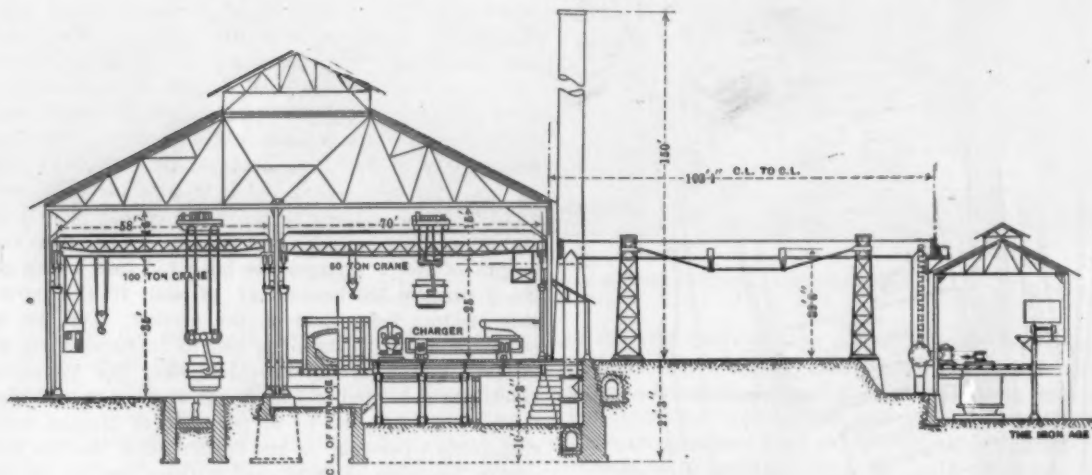


Fig. 4.—Cross Section through Open Hearth Building, Stock Yard and Producer House.

all the materials necessary for operation on the pouring side. One feature of the design was the provision of large furnaces in comparison with their rated capacity, so as to insure quick working. The regenerators are of good size, with large slag pockets under the gas and air ports. They are accessible from both ends, the removal of checkers being thus facilitated. The regenerators are built in pairs and incased with steel I-beams and plates. Gas and air valves are simple in design and in operation have proved very effective. They are of the mushroom type, the body being of sheet iron lined with brick. Each chamber has two valves, one to receive gas or air and the other to connect the chamber with the stack.

water sealed bottom and water cooled top, and their simple construction has given effective operation.

The output of steel has been about 400 tons a day, but the finishing capacity is considerably more than this, and the company has been a buyer of ingots and slabs in the market.

Paxton or No. 1 Plate Mill.

The finishing departments include a 126-inch three-high mill in the No. 1 or Paxton mill, an 89-inch and a 72-inch three-high mill in the No. 2 mill, a 42-inch universal mill and a flanging department.

The 126-inch mill was built in 1893 by the Paxton Rolling Mills, and at that time its rolls were the widest

east of the Alleghenies. This part of the plant is noteworthy for the liberal scale on which space has been apportioned to the various operations, particularly in the amount of cooling table space, these tables being 325 feet in length. The advantage accruing from the ability to hold a large tonnage of plates between the rolls and the shearing department, so that the laying out can be properly done, can be appreciated. The mill is especially well lighted and ventilated. It rolls steel exclusively and in serving it with ingots and slabs a locomotive is employed, running on a 3-foot gauge track. Commanding the stock yards and sheds is a Yale & Towne locomotive crane of 5 tons capacity. The gas plant consists of eight Wellman producers, which supply three regenerating

shears, capable of shearing steel up to 2 inches in thickness and of making a cut 135 inches in length. Their capacity is 200 tons in 12 hours. In the shearing house are also two pairs of scrap shears and a rotary shear, the latter driven by a 24 horse-power motor. It shears circular boiler heads up to 126 inches diameter. The shipping department, to which the plates pass from the shears, is 275 feet long, and is equipped with two electric traveling cranes of 8 and 15 tons capacity, having a span of 63 feet. It is possible to load six cars in the shipping department without making a shift. Boiler and fire box steel, including a large amount of Government work, has been the chief product of the No. 1 mill. Ship plates and structural steel have also been rolled. The plates for the

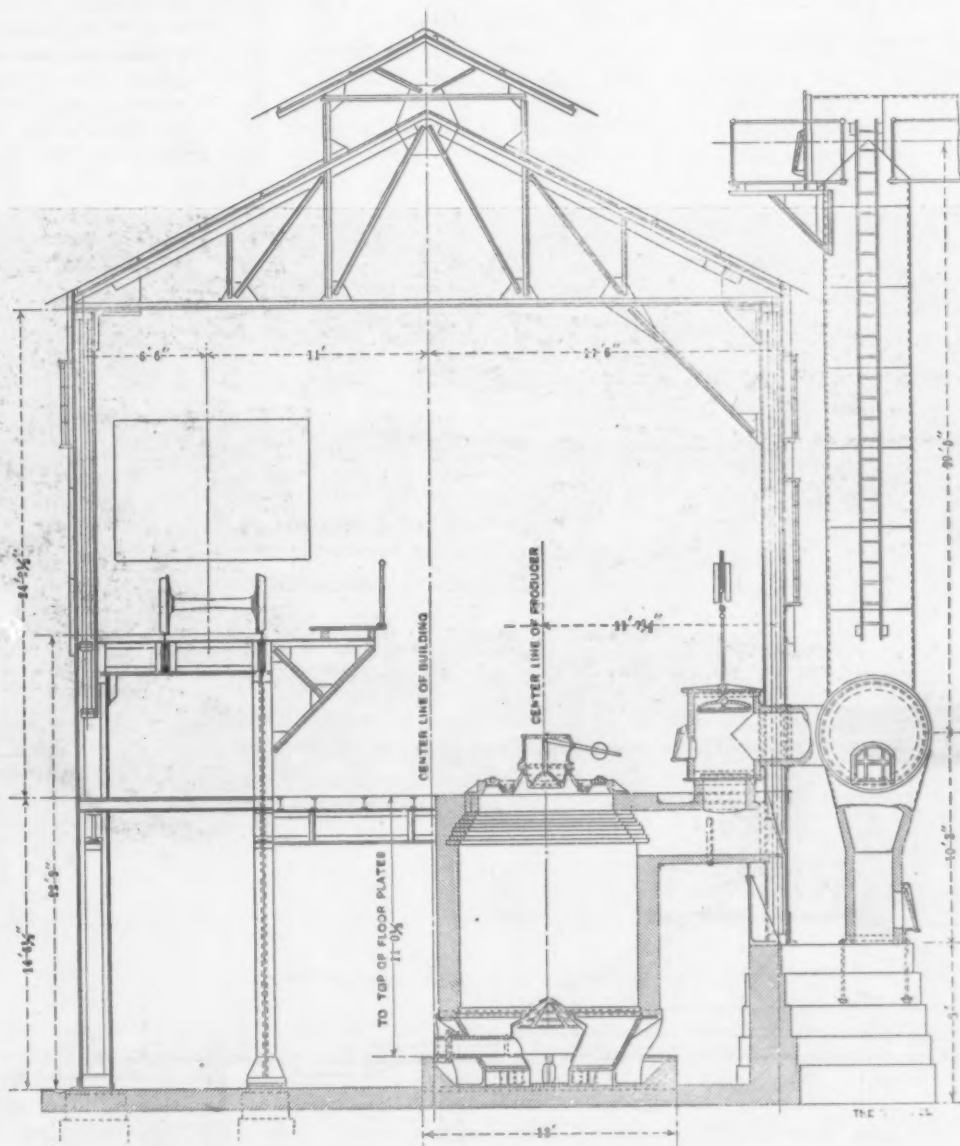


Fig. 5.—Section through Producer House, Showing Construction of Producer, Valves and Flue.

furnaces. There are also three coal fired heating furnaces. Two Kennedy-Alken hydraulic cranes of 6 tons capacity perform the operations of charging and drawing. A battery of eight Harrisburg Foundry & Machine Works boilers with Wilkinson automatic stokers furnishes steam for a 2000 horse-power tandem compound engine built by Robert Wetherill & Co. This engine has a 30-foot fly wheel weighing 50 tons which makes 80 revolutions per minute. For roll changing there are two hydraulic cranes of 25 tons capacity each. Two sets of Gordon pumps of 500 horse-power furnish 650 pounds pressure to the square inch for the hydraulic machinery.

The mill is three-high and the large rolls are 34 x 126 inches, their weight being about 37,000 pounds. The screwdown is electrically operated and the mill is equipped with improved tables. Plates are rolled up to a width of 122 inches and up to 55 feet in length. At the end of the 325 feet of cooling tables are two hydraulic

Albara bridge in North Africa were rolled on this mill; also plates for the Burmah viaduct in Rangoon, for the Coolgardie pipe line in Australia, for the United States cruisers Cleveland and Chattanooga, for the Williamsburgh bridge over the East River and for the Rapid Transit Subway in New York. R. H. Irons is in charge of the 126-inch mill.

72-Inch and 89-Inch Mills.

What is known as Mill No. 2 contains the 72-inch three high and the 89-inch three high mills, driven respectively by 300 and 500 horse-power engines. These mills roll either iron or steel plates of the lighter gauges down to $\frac{1}{8}$ inch. The mill is well equipped for the expeditious heating of slabs and their delivery on the roll tables. There are five heating furnaces to which blast is supplied from two large fans. The charging and drawing equipment is particularly simple in construction, as well as effective, as referred to more at length below. A

15-ton overhead traveling crane commands both mills as well as the roll lathe at the end of the mill building. Straightening rolls are provided to which the plates are carried after the last pass, and from thence go to the shears. There are two Morgan steam shears—110-inch and 100-inch guillotine shear—a 120-inch hydraulic guillotine shear, an 88-inch rotary shear for boiler heads and a 28-inch guillotine shear. There are also two pairs of scrap shears. A common shipping house for the two mills is commanded by a 5-ton crane for loading the finished plates. The No. 2 mill is in charge of DeWitt Fry and David Rogers.

In May, 1903, the 89-inch and 72-inch mills were completely destroyed by fire. They were at once rebuilt and modernized in every respect.

Guss Furnace Peel.

A special feature of the No. 2 mill is the ingenious apparatus provided for charging and drawing blooms and slabs. It is a furnace peel designed by Samuel M. Guss of Reading, Pa. As employed in this mill it is suspended

which slide on the journal b^2 against opposite faces of the bearing a , allow the peel blade to extend a greater or less distance beyond the bearing into the furnace, to suit different sizes of furnaces or of piles, ingots or blooms heated therein.

This peel has proved a simple, cheap and efficient tool for the various operations in handling the products of heating furnaces and also for saving labor, fuel and the wear and tear on the bottoms of furnaces. It gives a clean product, free from brick, sand marks, &c., an especially good point in handling steel for plates. It also keeps furnace bottoms from being torn or "slushed up," and saves sand by turning the piles flatly on the bottom of the furnace, thus doing away with "dollying." It saves fuel by requiring the doors to be opened but a minimum of time. The furnace can be charged full, since it is not necessary to leave room for the first pile or bloom to be turned. The cooling off of the peel blade is not necessary, as it can be worked when it is at a high degree of temperature. If the blade bends down it can be reversed and the next succeeding blooms will

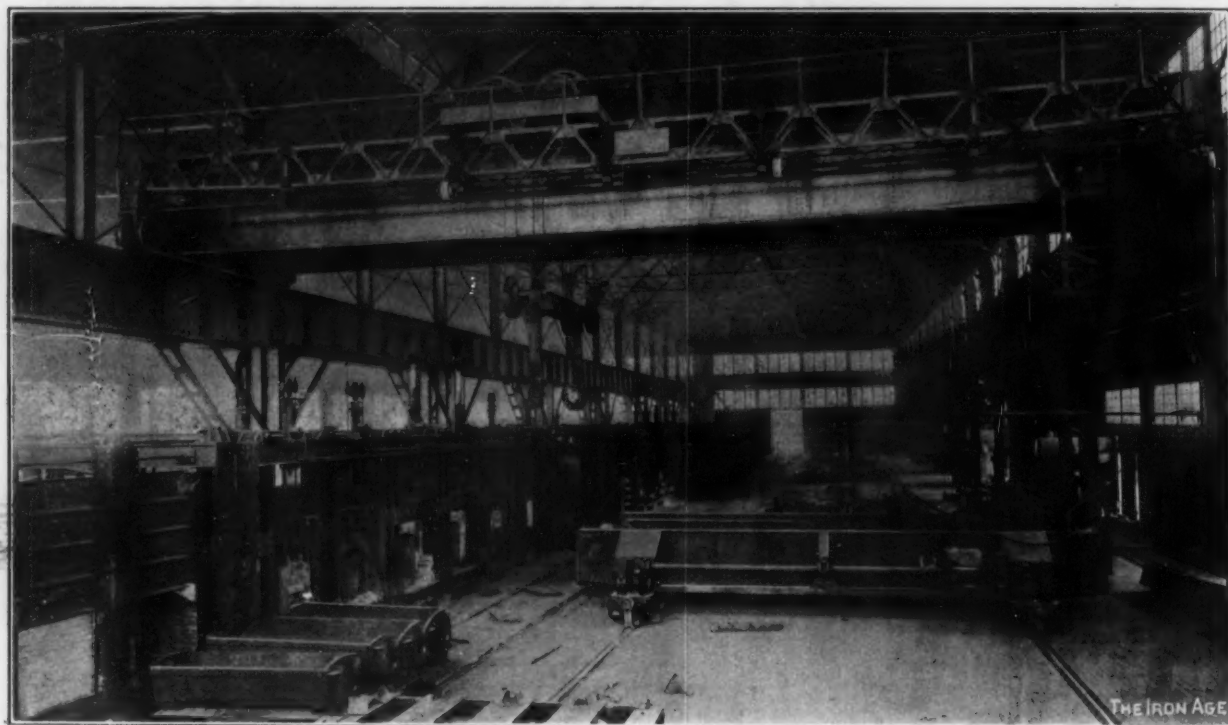


Fig. 6.—Charging Side of the Open Hearth Building.

from an electric traveling crane of 50-foot span, but is also adapted to be suspended from an ordinary power swing jib crane. Details of the device are shown in Fig. 11, and in Fig. 12 is a view of the peel, suspended from the crane, delivering a slab to the 89-inch mill. Fig. 11 shows an ordinary furnace in section through the door C with a pile or bloom L in position on the blade, charged in and ready to be lowered to the bottom of the furnace. The bent arm A which carries the peel at its lower free end a is suspended at a^1 from the crane trolley so that the vertical part of the arm will be in front of the furnace door while the blade B is introduced into the furnace in handling the blooms, which latter are carried upon the peel vertically in a plane approximately through the point of suspension a^1 for supporting the load in equilibrium. The peel consists of the blade B and elongated handle b^1 in a single piece, having a journal portion b^2 upon which the peel is mounted in the horizontal bearing at the lower end of the arm A. The extended handle b^1 being of smaller cross section than the journal portion b^2 is readily passed through the latter before inserting the cross bar or "wings" c^1 near the end of the handle bar. The journal portion, being of considerably greater length than the arm bearing, loosely occupies the latter, which allows the peel to be rotated or adjusted in and out relative to the supporting arm. For locking the peel in position the collars D and E,

straighten it, thus preventing blooms from being chilled where they are in contact with it. If the bloom falls on the floor the peel can be lowered to the floor level to pick it up. The peel can be used to change doors or door frames without cooling off the furnace and this is now done between heats. It is also employed for carrying furnace castings and setting them up during repairs to the furnace.

The Universal Mill.

The universal mill, which was started in December, 1892, and has been operated continuously since that time, consists of one 25-inch train, rolling plates from 8 to 42 inches in width and up to 100 feet in length. It was the first universal mill in the country to roll plates beyond 36 inches in width. The rolls are driven by a pair of Porter-Hamilton reversing engines, 30 x 60 inch, of 1500 horsepower each, and steam is furnished by 10 boilers of 125 horse-power each. There are four Alken furnaces of the Siemens type, fed by 10 gas producers. These furnaces have a record of heating the steel for 201 tons of finished material from cold metal in 12 hours. The furnaces are charged by an electric crane with peel attachment, which also draws the steel and conveys it to the rolls. The stock yard, from which ingots and blooms are conveyed to the furnaces, is traversed by a locomotive crane of 10 tons capacity. The shipping department is served by a 15-

ton crane. The universal mill hydraulic shears are supplied with power by two Wilson-Snyder pumps of 750 pounds pressure to the square inch. The product of this mill is both iron and steel. Plates for the Williamsburg bridge over the East River were rolled on this mill, and it is now furnishing plates for the new Blackwell's Island

the Delaware, for the Gray's Ferry bridge and the Rock Island bridge. Frank K. Binnix is in charge of the universal mill.

Flanging Department.

In 1897 a flanging department was added to the plant. It was burned in June, 1898, and in October of



Fig. 7.—Pouring Side of the Open Hearth Building.



Fig. 8.—Universal Mill Transfer Tables.

bridge which the Pennsylvania Steel Company is erecting over the East River, also plates for the large Quebec bridge at Montreal. The eye bars now being rolled for this bridge are the largest ever made, being 80 feet in length and 2 x 15 inches in thickness. From this mill came plates for the Pennsylvania Railroad bridge over

that year the complete new flanging machinery was in operation, contained in a steel structure much larger than its predecessor. Boiler heads from 12 to 120 inches diameter are flanged and a wide range of flue hole flanging is done. There are two heating furnaces, with blast and hydraulic equipment, and the charging is done by

an 8-ton Sellers electric crane. The flanging machine, of which a view is given in Fig. 13, is operated by a 75 horse-power engine and also by hydraulic pressure. Among the noteworthy equipment of this department is a heavy hydraulic press, recently installed; also a No. 6 Hilles & Jones punching machine, capable of punching a hole 2 inches in diameter in $1\frac{1}{2}$ -inch stock. The punch has 60-inch throat and is driven by a 10 horse-power

building adjoining the flanging department is a well equipped machine shop, in which repairs are made. John Campbell is in charge of the flanging department.

Coal Handling Plant.

In the line of new installation the coal handling plant that is now being erected calls for more than passing mention. A plan view is given in Fig. 14 and an eleva-

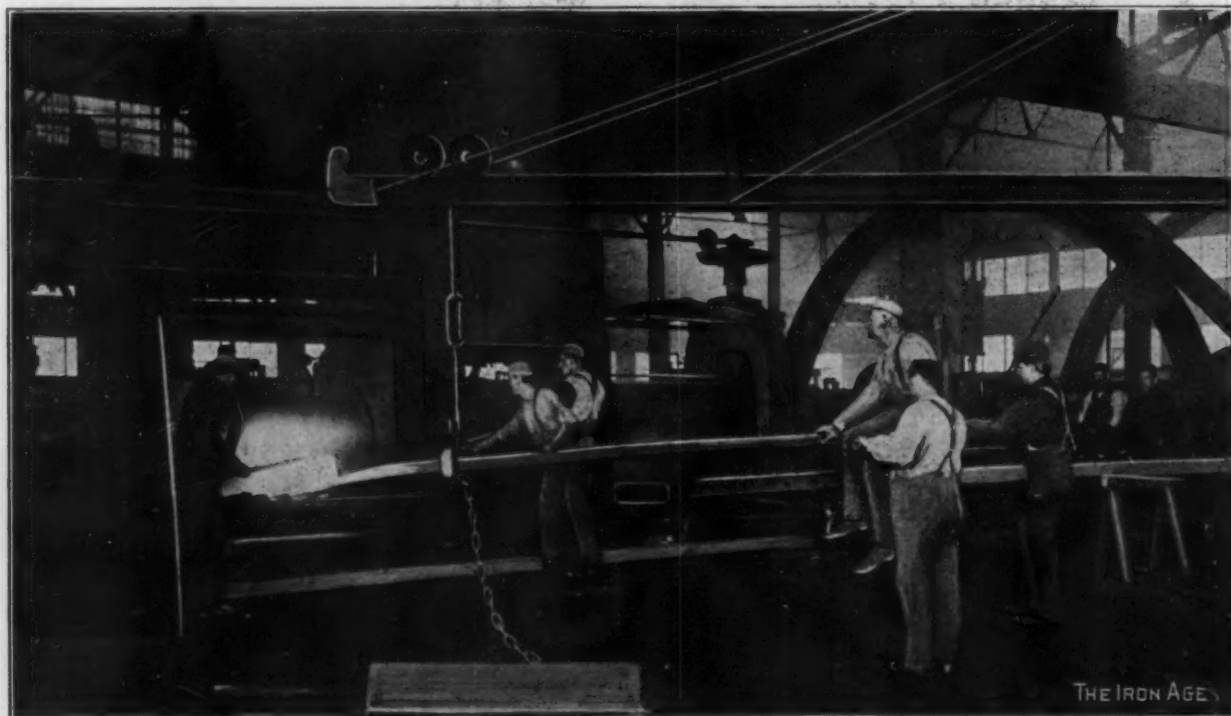


Fig. 9.—View in the 72-Inch Mill.



Fig. 10.—Transfer Tables in 89-Inch Mill.

engine. There are also a 5-ton steam hammer, a man-hole and collar flanging machine capable of handling heads and putting on collars 30 inches in diameter and $\frac{5}{8}$ -inch thick; a machine for facing manhole plates, and a large Bement-Miles radial drill. The flanging department has a capacity of 200 manhole heads 29 inches diameter and $\frac{3}{8}$ -inch thick and 20 manhole heads 72 inches diameter and $\frac{5}{8}$ -inch thick in 12 hours. In a

tion in Fig. 15. It was designed by the company to meet its own special conditions, the relation of the 72-inch and 89-inch mill heating furnaces and of the universal mill boiler house and the universal mill gas producers being such that on the triangular space adjoining these plants the coal could be unloaded for all three. The apparatus is to be built, moreover, so as to deliver coal to all three points of consumption. A tower of steel con-

struction is the central feature of the installation. The coal is unloaded from cars into a pit where it falls into a bucket. The bucket is then raised to the top of the tower and its contents dumped into a hopper. From this hopper branch several chutes constructed of riveted steel sheets. These distribute the coal by gravity to the various points at which it is wanted. It is calculated that the machine can handle 500 tons of coal in 10 hours.

The yard equipment of the company includes four locomotives for switching and the handling of freight between departments. In addition a Pennsylvania Railroad engine and crew are stationed at the plant. The amount of freight handled in and out, raw materials and finished products, is about 775,000 tons a year. The plate capacity of the mills is now nearly 200 times the 1000 tons per year turned out by the original Central Iron Works of 1853.

Testing Department.

Formerly the Paxton mill had its separate testing room, while another testing outfit was provided for the

and Gilbert M. McCauley the business continued to grow and the facilities to expand. The directors elected at the organization of the company were: J. Frederick Kernechan and Wm. H. Wallace of New York, and C. L. Bailey, James McCormick, G. M. McCauley, James M. Cameron, Henry McCormick, Vance C. McCormick and

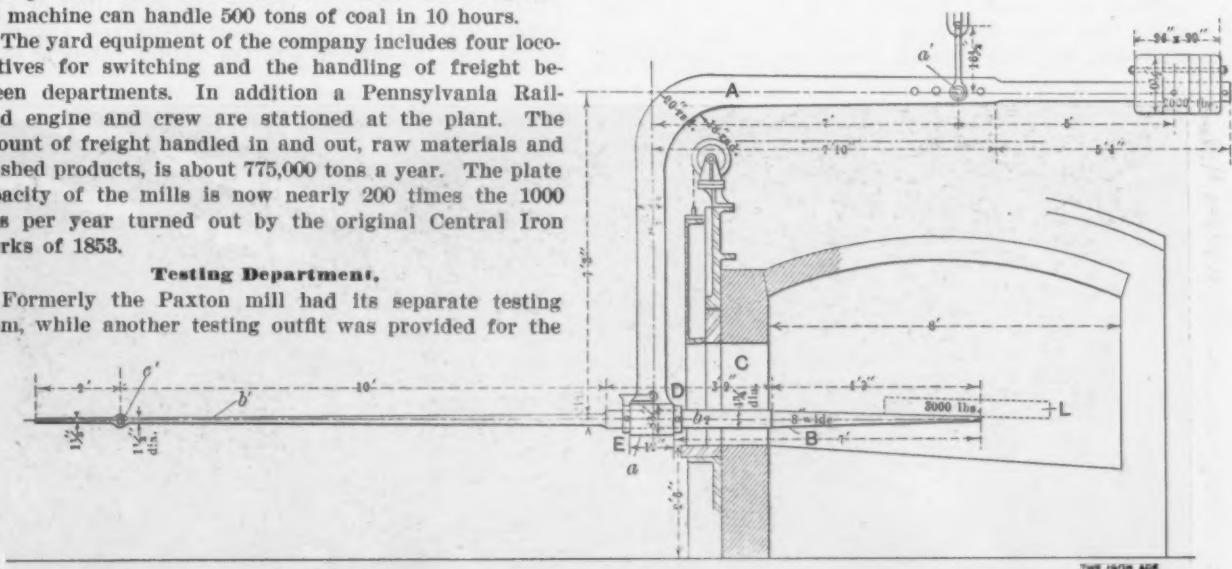


Fig. 11.—Section through Heating Furnace and Guss Peel for Charging and Drawing.

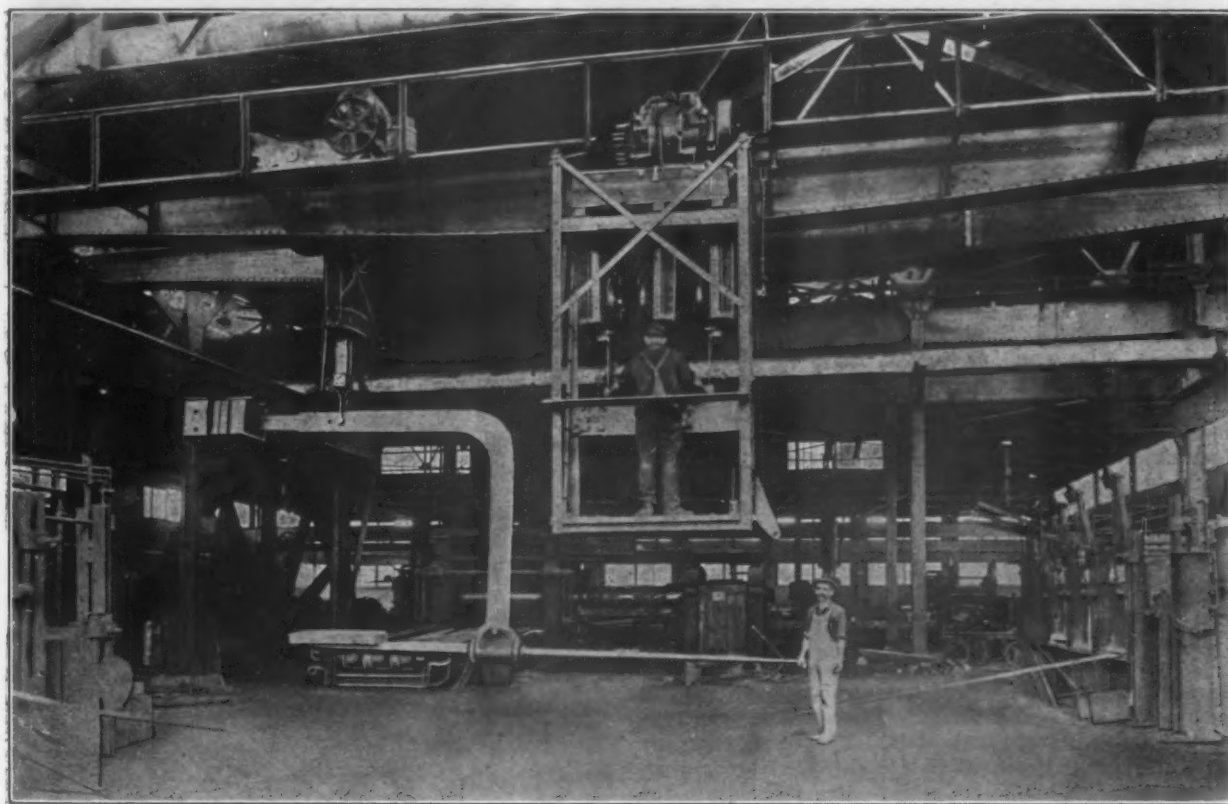


Fig. 12.—The Guss Furnace Peel in the 89-inch Mill.

universal mill and the No. 2 mill. These are now combined in one testing laboratory. The equipment consists of an Olsen automatic testing machine of 200,000 pounds capacity and one of 100,000 pounds capacity, a Sellers milling machine, an hydraulic press and two 125 horsepower electric motors.

Organization.

When the Central Iron & Steel Company was organized in 1897 the following officers were elected: President, Charles L. Bailey; vice-president, James M. Cameron; treasurer and general manager, Gilbert M. McCauley; secretary, S. B. Boude; general superintendent, J. N. Binnix. Under the administration of Charles L. Bailey

Edward Bailey. Official change came in 1899, when on the death of Charles L. Bailey, Edward Bailey was elected president. In the same year Mr. Binnix died, and in the spring of 1901 came the death of Mr. McCauley. The present officers are the following: President, Edward Bailey; vice-president, James M. Cameron; treasurer and general manager, James B. Bailey; secretary, S. B. Boude; general superintendent, George R. Bentley.

An important conference, which may result in the wiping out of the rebate system, was held at the offices of the Interstate Commerce Commission, Washington, D. C., December 28. A delegation of traffic managers of

Western railroads waited upon Chairman Knapp and Commissioners Clements and Cockrell, to advise them officially of the action recently taken at a conference of railroad interests in Chicago for the suppression of rebates and other improper practices. The commission has already been in communication with the managers of the important Eastern roads and has received assurances of a similar character from them. It is understood that the roads have arranged for a system of espionage, not only on each other, but also upon other

that in subsequent working the plates, sheets or wire produced therefrom preserve the same relative coating proportions in the coextension which takes place.

The copper is not drawn from the steel because the weld is absolute at the start and because of this absolute weld there is no blistering in the finished product. When the great difference is considered in the coefficients of expansion of aluminum, copper and steel, that of steel being 0.001, that of copper being 0.0018 and aluminum 0.0023, also the difference in the melting points of these

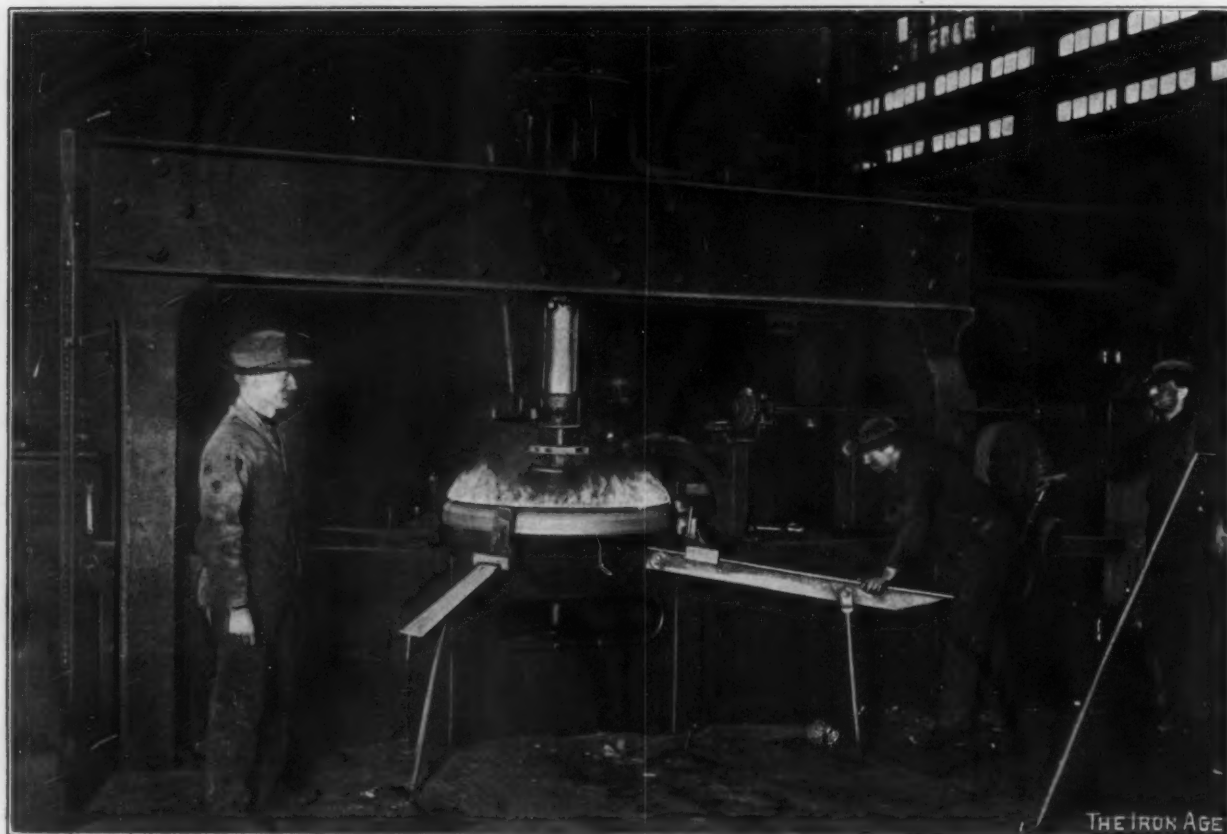


Fig. 13.—The Flanging Machine in Operation.

lines not represented in the conferences. Every violation of the anti-rebate law is to be reported at once to the Interstate Commerce Commission and the roads will furnish such evidence as they can procure in the case. The scheme meets with the hearty approval of the commission, which has always contended that the rebate system could never be entirely suppressed without the co-operation of the railroads.

Monnot Metals.

It has been the aim of metallurgists for many years to devise commercial means of welding copper to steel in such a way as to effect a durable, impervious, nonporous coating of the nonoxidizable metal. Electro metallurgists have also striven to accomplish this by electrolytic deposition, but with indifferent success, due probably to the fact that an absolutely autogenous weld is necessary to effect the ideal combination of such metals as copper, aluminum, silver and their alloys to iron or steel so as to allow of the subsequent working of such compound products. J. Ferreol Monnot, late of Paris, claims to have solved this most important problem and a suitable mechanical equipment under his direction is now rapidly nearing completion at Chester, Pa.

The new products are known generally as Monnot metals, subdivided according to the coating metals employed, as, for example, Monnot copper, Monnot aluminum or Monnot silver. By the Monnot process steel ingots, billets and bars are produced coated with copper, bronze, aluminum or silver. This coating is autogenously welded to the steel core or base in any proportion required. The desirability of securing a fixed proportion of coating to base metal is evident when it is understood

metals, copper at 1050 degrees C., aluminum at 625 degrees C. and steel at 1600 degrees C., Mr. Monnot's inven-

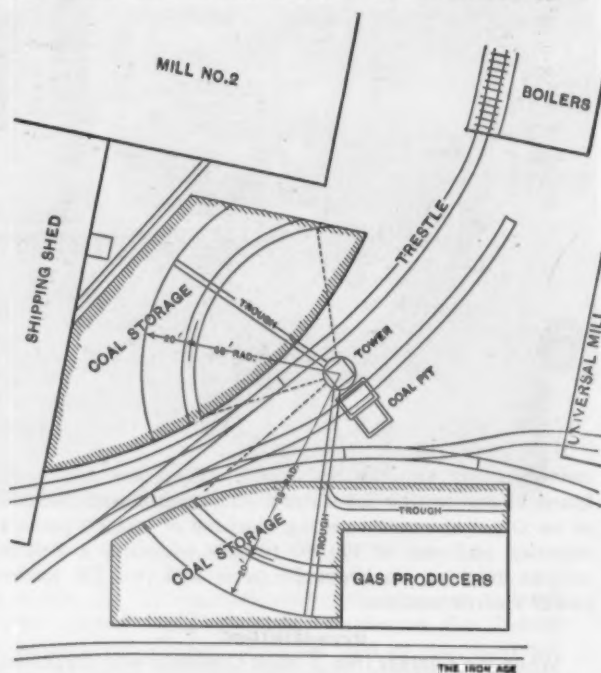


Fig. 14.—Plan of Coal Handling Plant.

tion is notable. Plates and sheets of Monnot copper have been heated to various temperatures below the melting point of copper and immersed in ice water without any

evident detrimental effect as a result of this severe test. In proof of the remarkable feature of even coextension of the core and coating metals, Monnot copper has been rolled down to a thickness of 1-1000 inch, and subsequent chemical analysis showed the exact proportions maintained in this thin film that were present in the sheet bar from which it was produced.

Monnot metals are unlike baser metals coated electrolytically, the Monnot coating being a firm, hard, well worked, nonporous one absolutely welded to the base metal, whereas electro plating affords simply a deposit of the coating metal which will not endure drawing or rolling. The new products combine in one all of the separate advantages of both metals employed to the exclusion of the inherent disadvantages presented by the use of these metals separately.

Chief among the Monnot metals is Monnot copper. This can be furnished either "hard bright" or "dead soft." It works like steel except that the steel worked out of reach of the influence of the air in an envelope of copper appears to afford special advantages. Monnot metal can be rolled, cupped, drawn, spun, stamped or hammered as one homogeneous metal. A special grade of steel is em-

ufacture of boilers, feed water heaters, pumps, pump rods, fire extinguishers and hundreds of other articles like corset steels, hooks, eyes, military buttons, window weight chains and the like.

The Duplex Metals Company, with \$3,000,000 capital, organized under the laws of the State of New York, controls the manufacture and sale of Monnot metals exclusively throughout the United States. This company has offices at 208 Fifth avenue, New York City, and is at present busily engaged in remodeling and making extensive additions to the plant formerly occupied by the Combination Steel & Iron Company, at Chester, Pa. The company is preparing to make three regular grades of copper coated steel as follows: Grade A, light coat; Grade B, medium coat, and Grade C, heavy coat.

Monnot copper of Grade C will be found equally dur-

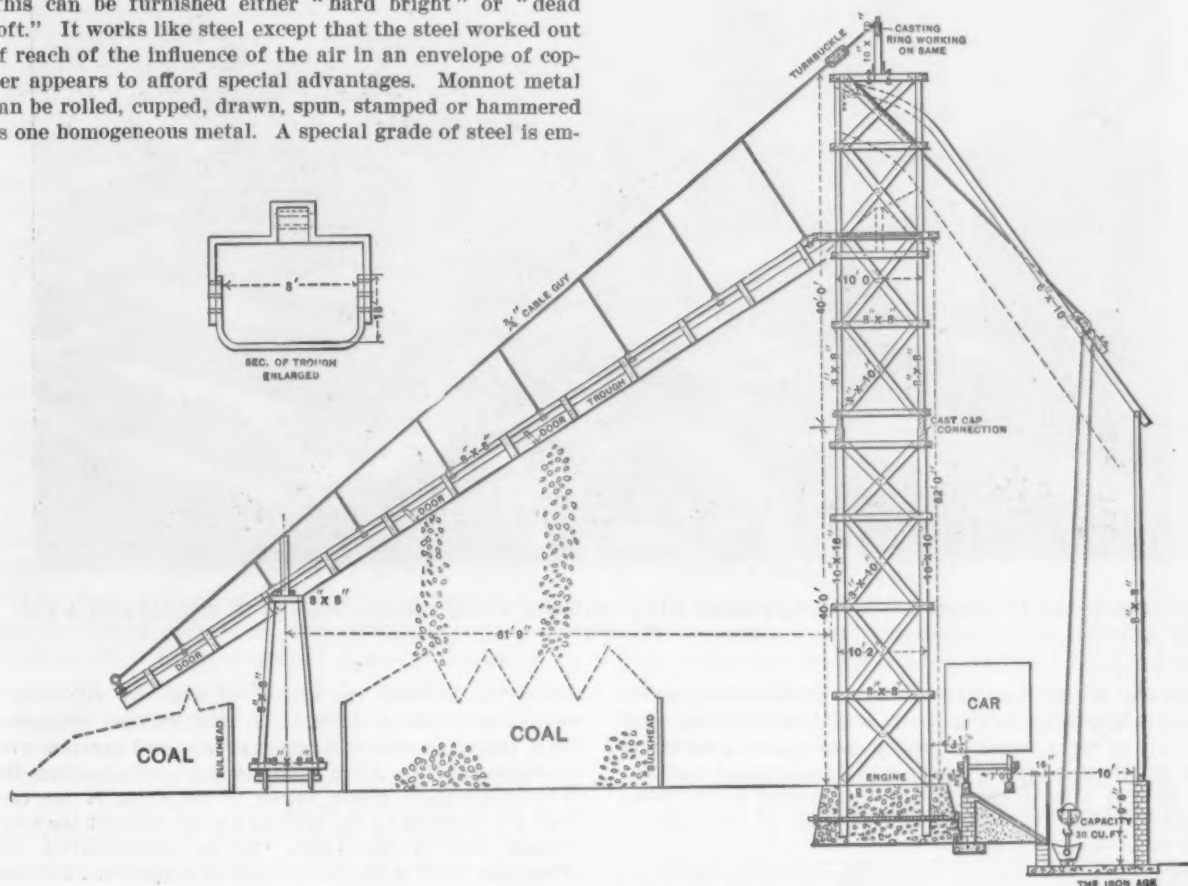


Fig. 15.—Section of Tower, Pit, Trough and Coal Pile.

ployed in its manufacture, and the process may be classed as a thermo-chemical operation.

Of the various uses to which Monnot metal can be put, a few prominently brought to mind are its application for roofing, cornice work, gutters, leaders, blinds, shingles, screens, &c. For these purposes it will doubtless prove superior to copper, owing to its lasting qualities being the same and its coefficient of expansion being practically that of the steel employed, thereby obviating one of the serious troubles now experienced in the use of pure copper. For fine plumbing, seamless tubes, water heaters, furnace jackets, smoke connections and hot air conduits Monnot metal should also prove superior. In shipbuilding, plates, masts, spars, smoke funnels, ventilators and stays, such a nonoxidizable metal, affording the high elastic limit and tensile strength of steel, will at once be appreciated.

Monnot metal wire supplies a long felt want for telegraph and telephone connections. It compares most favorably with hard drawn copper, as shown by numerous tests made. The tensile strength of Monnot copper wire varies from 90,000 to 110,000 pounds per square inch. Monnot copper of Grade B has 99 per cent. of the elastic limit of steel wire, same diameter; Grade C has 85 per cent. Wire thieves will find their vocation unprofitable where Monnot metal is employed.

Monnot metals will come into wide use in the manu-

able to pure copper, affording in addition tensile strength, elasticity and the low coefficient of expansion deficient in the copper alone. An added advantage of great importance is afforded by Monnot copper due to its lower specific gravity as compared with pure copper. Pound for pound with sheets of the same thickness it will cover 12½ per cent. greater surface.

Mr. Monnot, inventor of the process, is president of the company. He will remain in the United States and devote his sole attention to the manufacture and sale of the company's products. He is a graduate of the Ecole Supérieure des Mines of Paris. After completing his education in that institution in 1885 he devoted his time to perfecting himself in his profession by special study of practical methods employed in several prominent metallurgical manufacturing concerns in Europe. He has also been prominent in Venezuelan industrial development, having spent seven years in that country, and is credited with the establishment of the balata industry in South America. Byron E. Eldred, a mechanical engineer who has been prominently identified with special metallurgical combustion work in this country, is associated with Mr. Monnot as secretary and treasurer of the company. Mr. Eldred will be attached to the New York office of the company and in addition to the usual duties of the office of secretary and treasurer will have charge of the selling end of the business.

Underwood Lathe Attachment for Boring.

An attachment for converting a lathe into a horizontal boring machine is a new product of H. B. Underwood & Co., 1025 Hamilton street, Philadelphia, Pa. The attachment is placed in the position ordinarily occupied by the cross slide, which must be removed when the lathe is to be used as a boring machine. It serves the same function as the work table of a horizontal boring machine and is adjustable laterally and vertically. The boring tool is mounted on a bar supported between the

The surfaces of this angle plate are planed square or parallel with all the other parts of the attachment. The vertical adjustment of the table plate on the supporting casting is effected by an adjusting screw. The bed of an attachment for a 30-inch lathe has three T slots for $\frac{5}{8}$ or $\frac{3}{4}$ inch bolts, is 31 inches long by 22 $\frac{1}{2}$ inches wide and has a vertical adjustment of 5 $\frac{1}{2}$ inches.

When set on the lathe carriage the attachment is true with the carriage in all directions and the upwardly projecting member of the angle plate is planed square with the surface of the table and parallel with the lathe

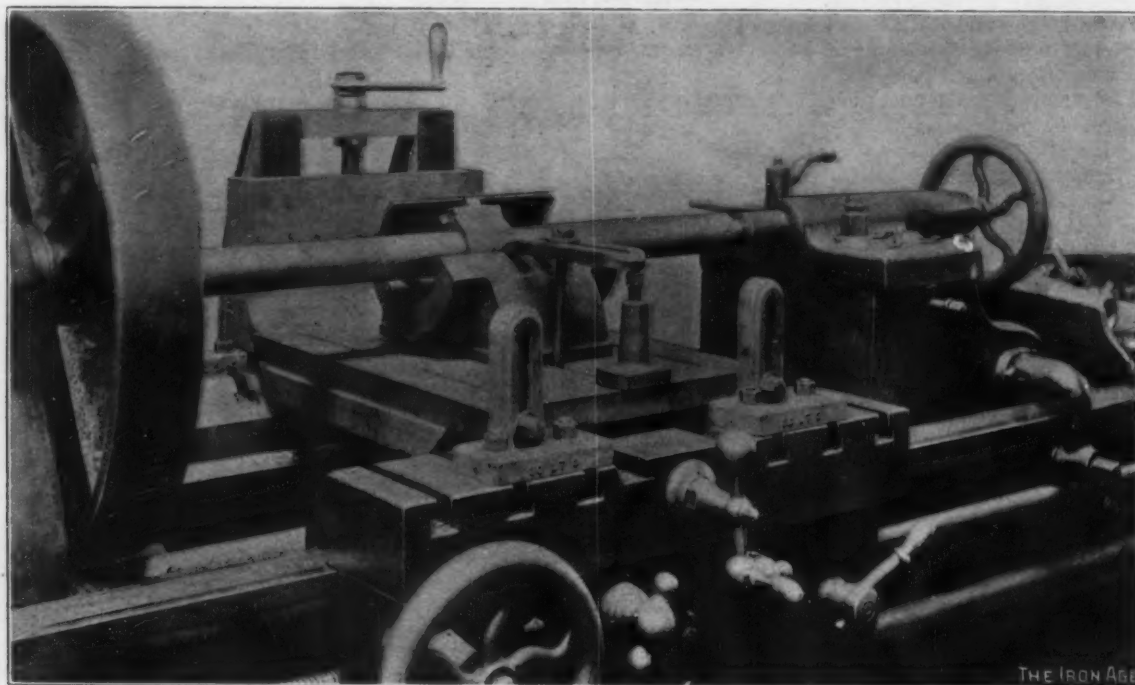


Fig. 1.—An Attachment for Converting a Lathe Into a Horizontal Boring Machine.—Made by H. B. Underwood & Co., Philadelphia.

head and tail of the lathe. A lathe with a boring equipment is illustrated in Fig. 1. It is claimed that the work done is in every respect equal in quality and quantity to the output of a regular boring mill of equivalent capacity.

In Fig. 2 is a view of the attachment alone, taken from the opposite standpoint from that of the view in

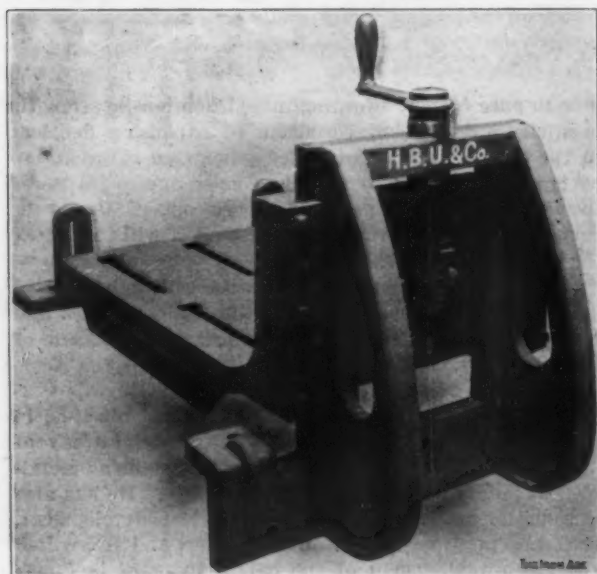


Fig. 2.—View of the Attachment from the Rear Side.

Fig. 1. It consists in the main of two castings; one, resembling in miniature the housings of a boring mill or planer, is attached to the rear of the lathe carriage, and the other is a horizontal table plate having a vertical leg adapted to slide on ways planed on the rear casting.

spindle to facilitate the setting of work by affording a surface to measure from. By the vertical adjusting screw the table is either raised or lowered parallel with the lathe shears. After being brought into position the two slotted angle pieces bolted to the front of the carriage are clamped to the table to rigidly support the overhanging end of the table. In its manipulation the adjustable table is similar to that of a standard horizontal boring machine and does away with blocking up or other slow methods of setting work commonly resorted to when a lathe is used for boring.

This attachment may be readily fitted to any lathe, it being necessary only to remove the tool slide and drill and tap the holes in the back of the carriage for securing the upright casting. Thereafter the time required to change the lathe from a turning to a boring machine is accomplished in a very few minutes.

The weight of the attachment for a 30-inch lathe is 685 pounds. For this size a 3 or 3 $\frac{1}{4}$ inch boring bar with suitable cutter heads and automatic feed is recommended. It is desirable not to depend on the lathe centers for the support of the bar, but to secure one end of the bar to the face plate or in a chuck and to support the other end in a steady rest or a similar bearing. The equipment is then equal in capacity to that of a powerful boring mill.

The Firth-Sterling Steel Company, Pittsburgh, whose works are at Demmler, Pa., has purchased about 70 acres of ground at Giesboro Point and expects to secure about 200 more. It is the intention of the company to move its projectile department to the new site, for the reason that the large increase in its tool steel business demands additional facilities and there is no available land adjacent to the property at Demmler which can be utilized for additions. Reports that a \$5,000,000 plant would be built at Giesboro Point are untrue.

The Semi-Centennial of THE IRON AGE.

An Anniversary Retrospect.

An event is always of more importance than its date. Indeed, the interest of the date is wholly dependent upon the consequence of the event with which it is identified.

The semicentennial anniversary of the founding of *The Iron Age* was reached and passed in midsummer of last year. Its commemoration in this retrospect was deferred until the matter presented would have greater interest for the thoughtful reader than it could be expected to have in the vacation season.

The year of the founding of *The Iron Age*, from which it dates continuous publication, was 1855. Owing to the loss of the earliest office file the exact date is a matter of calculation rather than of documentary evidence. That it was in the summer is known; to be more exact, even if possible, would serve no useful purpose. The reason calculation does not fix the date absolutely is that there is some uncertainty as to the intervals of publication of the very earliest issues.

That these beginnings were small and tentative and that the initial purpose of this newspaper was different from that which developed later as the result of rapidly changing conditions is not surprising. It would have required prophetic gifts of the highest order to have foreseen before the outbreak of the Civil War what would be needed in a useful journal of the hardware, iron and steel trades and their allied industries after that great historic epoch which forced an unexpected and otherwise impossible development all along the line. Thus endowed, the limitations and restrictions of the time would have defined themselves so sharply that the founder would probably have lacked the courage to venture the attempt. It is very easy to say that "if one's foresight had been as good as his hindsight," &c., but fortunately it never is. The result of such knowledge would be an effort to adapt what one does rather to the future than to the present, with the consequences which almost invariably attend premature effort. To give the reader what he wants when he wants it is the secret of success in newspaper publication. In 1855 he certainly did not want what he expects and finds useful in 1906, and if the newspaper of 1906 could by any possibility have been published in 1855, all the capital in the United States available for such a venture could not have made it commercially successful.

In celebrating by a historical retrospect the founding of this newspaper half a century ago we shall as far as possible restrict the scope of our inquiry to matters of interest to the readers of the present time. Our chief regret is that so few of those who were contemporaneous with the beginnings of *The Iron Age* remain to exchange with us the congratulations which are appropriate to a semicentennial anniversary. Of those no

longer here to offer us the greetings of old friends we can but write in the language of the stately ritual of Rome:

Requiem æternam dona eis, et Lux perpetua luceat eis.

The Progress of Half a Century.

To appreciate the nature and potency of the influences co-operating to render possible the up-building of a technical and trade newspaper one must understand and comprehend not merely the conditions of its birth, but the changes in its environment during the period of its growth. Usefulness and success are relative terms. They really mean in the last analysis adaptation to existing conditions. This is peculiarly true of the usefulness and success of a newspaper. At any stage of its development it must be judged solely from its relation to the needs it seeks to supply.

The beginnings of *The Iron Age* were contemporaneous with the beginnings of a progress in the material arts without parallel in the world's history. It could not have begun with reasonable chance of success sooner than it did; had it been long postponed the need would perhaps have been met in other ways.

The nineteenth century witnessed a development in the arts and sciences more rapid and more uniform than that attributable to all the centuries of the historic period which preceded it. What may have happened in the mysterious "East" before the curtain rose upon a civilization of unknown antiquity is a matter of conjecture, but it is safe to assume that, however high in some aspects, it was very unequally developed and that there are no "lost arts." The nineteenth century received undiminished its heritage of knowledge and added thereto vastly more than it had received. It was the golden age of invention and discovery, probably because it found itself confronted with so many relatively easy problems. For no subsequent century will a like opportunity exist.

Discovery and Invention.

Grant Allen, in one of his charming natural history essays, tells us that for centuries there has been a struggle between the squirrels and the nuts. The nuts for their better self-protection have been thickening their shells and the squirrels to get their food the better have been strengthening and sharpening their teeth, with the net result that all the soft shelled nuts have been eaten and are extinct in squirrel-haunted forests and the squirrels with dull and weak teeth have starved to death and left no successors. This happy conceit may very well be chosen to illustrate the relation which for a century has existed between the inventor and his problems. A few basic discoveries of natural phenomena, before un-

observed or quite misunderstood, opened the door to thousands of relatively easy problems in chemistry, metallurgy, mechanics and engineering. The difficulties they presented were largely the result of the limitations which hampered the inventor in available materials and tools. The end of the century found most of these relatively easy problems, and many of those presenting great difficulties, successfully solved. There now remains very little room for the empirical inventor who turned to practical account the happy accidents which he had learned to observe and reason about. In a word, the soft nuts of the arts and sciences have mostly been eaten, and the race of inventors who did little more than pick up what they found lying around neglected, if not dead, has lapsed into relative unimportance.

This illustration applies better to the first half of the nineteenth century than to the last half. Especially in its last quarter it was made glorious by results which confused statistics and silenced prophecy.

Electrical Applications.

It was not until May 24, 1844, that the first intelligible message was sent over the wires stretched between Baltimore and Washington, in the words: "What hath God wrought?" Practically the whole system of electrical communication has developed since 1855, the year of the beginning of *The Iron Age*, certainly all of it which contributed to the facilitation of trade. Duplex telegraphy was not reached until 1872, and multiplex not until 1878. Electric signaling began in 1857, but did not reach an important development until some ten years later. The first Atlantic cable message, from Queen Victoria to President Buchanan, was sent August 16, 1858. Wireless transmission is, of course, a matter of yesterday.

The development of electricity for power purposes and the dynamo for its generation has all happened within about 40 years. Hjorth's dynamo, the forerunner of this type of machines, appeared in 1855. In 1866 Wilde produced his dynamo with permanent magnets to excite the coil-wound field magnets of a large machine. The present type of dynamo, which dispenses with permanent magnets, was made by Siemens in 1869. Since then all the work of Weston, Brush, Thomson, Houston, Edison, Westinghouse and the other great mechanics who have contributed to the perfection of the dynamo and the utilization of electric currents has been done.

The electric railway was built in 1879; the first in the United States in 1885. The electric motor was an accidental development from the dynamo in 1873. Considering the present magnitude of the electrical development and its relation to civilization the newness of it all is startling, even to those of us who witnessed its tentative beginnings and wondered what potentialities of practical usefulness might reside therein.

Electric lighting is still newer. The practical arc was born in the Jablochkoff candle of 1877. The arc lamp of the modern type was developed between 1878 and 1883. For the first incandescent lamp we waited until 1883.

The telephone, which perhaps more than anything else has revolutionized modern business methods, reached the domain of the practical about 1876. That in less than 20 years it would leap from the status of a scientific toy to that of an instrument of universal utility not even the most optimistic prophet would have ventured to predict. It is of interest to mention in passing that for several years after the telephone had come into general business use it was refused admission to the office of *The Iron Age* on the ground that it was liable to be used as

a vehicle of misleading trade information and that its easy facility might be abused by designing persons to the injury of others. This reasoning was probably good at the time, but would not carry conviction to-day. The point of view has changed.

The Steam Engine.

The birth of the steam engine long antedated the period under review, but it was almost in its infancy 50 years ago, and the progress since 1855 covers more ground than lies between the Marquis of Worcester in 1633 and James Watt in 1782—more, indeed, than between Watt and Corliss in 1849. To follow its development would be interesting but to little purpose in this connection. Only one fact of exceptional significance needs to be referred to here—the working out during the past half century of the cycle of progress in prime motors from the simple, through the almost infinitely complex, and back to the simple in almost the original form of steam utilization for power purposes.

The beginnings of the steam engine are found in the *Æolipile* of Hero of Alexandria, in which a sphere into which steam was admitted through hollow trunnions and escaped through arms terminating in contracted nozzles set at right angles to the axes of these arms was caused to rotate by the resistance of the air to the steam escaping from these nozzles. It was exhibited at the Serapeum, in Alexandria, in the year 150 B. C. In 1679 A. D., Branca, in Rome, described his "wheel"—a device in which a jet of steam was directed against the vanes of a wheel revolving in a horizontal plane and which was thus caused to rotate.

Throughout most of the Nineteenth Century, but especially in its latter half, the steam engine was refined almost to the point of sublimation. The greatest mathematicians and mechanics of the period studied its problems and year by year it was improved and differentiated until, so far as the reciprocating engine was concerned, it seemed as if any further effort in the direction of economy would defeat its purpose through increase in initial cost. Indeed, it looked as though the steam engine had been made as nearly perfect as human ingenuity could make it, but about 1884 a new type of prime motor made its appearance and began slowly to gain the confidence of those who at first regarded it much as the designer of hydraulic pumps regards the pulsometer. This intruder into the field of steam engineering was the steam turbine, which has had the most remarkable development within a few years, scarcely more than ten, that has ever been witnessed in this field of effort. It is pushing the reciprocating engine out of many of its most important uses.

Thurston in one of his last contributions to technical literature said: "Probably never in the history of engineering was so simple a machine made the object of investigation by so large a number of able men, inventors, constructors, engineers and men of science, and the subject of such extensive experimental research. It is very possible that through the development of this ancient device we may yet see the nearest approach to ideal thermo-dynamic and mechanical efficiency in the group of heat motors that man can attain."

Transportation.

The progress of half a century in rail transportation, so controlling in its influence upon every department of productive and distributive industry, marks neither its beginning nor its consummation, but it covers the most eventful period of its growth and differ-

entiation. The crude, wasteful, incendiary wood-burning engine of 1855 bore about the same relation to the standard type of locomotive engine now in use that the primitive strap rail or its cast-iron successor bore to the standard steel rail of the present time. In 1855 the entire railroad mileage of the United States was 18,374 miles, less than the mileage now operated in New York and Pennsylvania.

The manufacture of heavy iron rails began in this country in 1844, but was a slow development. The first 30-foot iron rail, then deemed a wonderful achievement, was rolled at the Cambria works in 1855. A considerable number were made, but they were unsalable and were used in mill sidings at Johnstown. The first Bessemer steel rail ever put into use anywhere was laid in the main line of the Midland Railway at Derby, England, in 1857. Not until 1865 was the first Bessemer steel rail rolled in this country.

Steam Navigation

has experienced a development almost parallel to that of the railroad. It had in 1855 reached a plane on which it was possible to build that magnificent failure, the Great Eastern, which was begun in 1854 and completed in 1858. Sir I. Brunel was her designer. She had both paddle wheels and screw, and depended for propulsion upon engines with an aggregate of 10,000 effective horsepower. The Deutschland of the Hamburg-American line has engines of 36,640 horse-power. She is 7 feet shorter than the Great Eastern, 16 feet narrower in the beam, 13½ feet less in depth, and draws nearly 4 feet more water. Her displacement is 5000 tons less, but she travels nearly twice as fast, the difference being as 23½ to 12 knots per hour.

Iron clad war ships, or floating batteries, were first used in 1855 in the Crimean War. The entire development of modern types in naval architecture has taken place since that date, and is thus exactly contemporaneous with *The Iron Age*. Indeed, *The Iron Age* is a little older than the armored battle ship, as the first sea going vessel of this class, the French Gloire, was floated in 1857, followed by the British Warrior in 1859. In 1861 the Ericsson Monitor introduced the "cheese-box-on-a-raft" type, to give place in turn to the present type of turreted battle ship, probably the most complex organism ever devised by man.

In 1855 less than 30 per cent. of the ocean freights of the world was carried by steam; to-day somewhat less than 23 per cent. is carried by sail.

Ordnance, Arms and Explosives.

Coincident with the development of the iron clad war ship the past half century has witnessed a progress in ordnance and ammunition in consequence of which the most formidable of floating fortifications appears no better able to take care of itself than was the wooden ship of the first half of the nineteenth century. The relatively easy annihilation of the fleets of China, Spain and Russia in three recent wars has shown that to the projectiles which it is now possible to send after them the most heavily armored ships are extremely vulnerable. This progress has all taken place within the life of *The Iron Age*. In 1855 Armstrong astonished the world with his gun and its performances, and gave a new direction to invention in this field. This breech-loading mechanism was made practicable in 1858, but came into very limited use until after 1866. The modern type of the rapid-fire, breech-loading cannon was not developed until about 1885, and it was with this type of weapon that Dewey at Manila and Schley at Santiago swept the Spanish navy from the sea. The small machine gun of the Gatling

type, for field use, did not make its appearance until 1862. The modern type of the revolver with its five or six cylindered chamber and shell ejector was brought out in 1865. The magazine gun was first employed in military armament as late as 1866, in the war between Prussia and Austria.

The center fire copper cartridge was introduced about 1855. Gun cotton was discovered in 1846, but was not employed usefully until 1864. Dynamite was introduced in 1868. It may be truthfully said that modern warfare on both sea and land has developed during the life of *The Iron Age*.

Printing and Paper.

In the peaceful arts the progress of the "Art Preservative" within half a century has made possible the production of a newspaper of modern proportions and of the standards of excellence in mechanical execution now demanded. The early issues of *The Iron Age* were printed on a hand press. The power press, with the development of which the names of two of America's greatest and most useful inventors, Robert Hoe and Stephen Tucker, are so intimately and honorably identified, had scarcely more than made a beginning in 1855. Stereotyping was not deemed practical for newspaper work until about 1861.

Paper making, one of the oldest of the arts, was a relatively important industry in 1855, but the product of printing paper in that entire year would scarcely feed the presses of 1906 for a single week. Wood pulp for paper stock was not developed in this country, even on a small scale, until about 1858.

The type setting machine, taking the place of the compositor picking up his letters one by one, fumbling them in calloused fingers and inserting them singly in the "stick," with his picturesque false motions and wasted energy in hovering unprofitably over his case, had its birth about 1860, but not in a useful way. The linotype machine is of the period of 1884-1885. The modern compositor, sitting in a chair and touching lightly the letters on the keyboard before him, with the speed and inerrancy of the experienced operator on the typewriter, has no chance for false motions. His muscles cannot respond as quickly as his eye reads and his brain conceives the copy, and every motion must "tell." It is but fair to say that he has very much cleaner copy than his predecessor ever saw. With the illegible pen-wrought manuscript of 50 years ago, written subject to correction and frequently to revision in proof, the speed and economy of the linotype would disappear.

Labor Saving Machinery.

Of what the half century has given us in this classification it is possible to speak only by examples. In 1855 there was not a typewriter in commercial or editorial use in the United States. There were few if any thus employed much prior to 1875. In business correspondence the pen written letter is now almost as much of a curiosity as was the letter printed in capitals of the primitive typewriting machines up to 1870, and for some time thereafter. Much the same is true of the sewing machine. First made approximately practical in 1846, it was not adapted to general use until about 1850. The great development of this industry was all within the last quarter of the nineteenth century.

On the farm the only labor saving machines used up to 1855 were of the crudest and simplest types. Invention had, however, been busy in meeting the needs of the farmer. In a competitive test held in France in that year only three forms of reapers were entered, and as might have been expected the American machine took

the honors. It cut an acre of oats in 22 minutes. The English machine needed 66 minutes and the French 72 minutes. This ratio of effectiveness has been fairly maintained ever since. With the aid of highly developed machinery the great expansion of agriculture in the West has nearly all been within the past 25 years, with results of incalculable importance as affecting the growth and prosperity of the Republic.

Chemistry.

The entire nineteenth century was a brilliant panorama of chemical discovery. It began slowly and gained impetus year by year, until it became a bewilderment to the onlooker. It was not until after 1855, however, that false concepts based upon the old electrochemical dualistic theory gave place to sounder and saner concepts, which are the bases of the now accepted system, to be in turn shaken, but perhaps not overturned, by the astounding phenomena of radioactivity. It was not until 1886 that the discovery of the first of the aniline series opened the way to synthetical production of practically everything in the almost limitless classification of the carbohydrates. Of the relation of industrial chemistry to the progress of the arts it would be impossible to speak. A volume of generous proportions would be needed to even catalogue the triumphs of the laboratory.

Civil Engineering.

In civil engineering the progress of the past thirty-five years has been rapid, without precedent or parallel. Much of this is due, of course, to the improvement, multiplication and differentiation of the materials at the command of the engineer. The commonplaces of civil engineering to-day are mostly new. For example, the earliest patents on the cantilever principle in bridge construction bear date of 1873. The greatest example of this type of construction and one of the oldest is the Firth of Forth Bridge, a mile and a half long and having a central arch giving 361 feet clear space above the water. It was begun in 1882 and finished in 1890. The first Niagara Suspension Bridge was built in 1855. The Brooklyn Bridge was finished in 1883. The pneumatic caisson, which replaced the ancient diving bell and made practicable the great bridge pier constructions now required, was successfully applied after 1872.

Tunneling and mining were revolutionized in 1862 by the rock drill operated by compressed air. The Mont Cenis Tunnel, seven and a half miles long, was begun in 1857 and proceeded so slowly by hand drilling that its completion was not expected for thirty years. Rock drills so facilitated the work, however, that it was opened in 1871. The St. Gothard Tunnel, nine and a half miles long, begun in 1872, was finished in less than ten years. The Arleberg, another Alpine tunnel, six and a half miles long, begun in 1880, was finished in less than four years. These comparative figures are cited merely to show the improvement in engineering skill and the facilities during a period of only about twenty-five years.

The earliest forms of the shield for tunneling through mud or silt were put into experimental use in 1843, but not until the improvements of Beach in 1869 and Greathead in 1890 did they reach a development which made practical such great undertakings as the Hudson and East River tunnels, now in progress.

The Suez Canal was considered as long ago as the time of Herodotus, but it was not built until 1860-64. Since then great improvements in canal cutting and dredging have been made within twenty years. Among the facilities which simplify and cheapen such work, cable trams and endless bucket cutters take high rank.

Blasting has been greatly simplified by the improvements in explosives.

The Mississippi jetties, which have so improved the navigation of that river, were built between 1875 and 1879. They jumped the grain export via New Orleans from half a million bushels in 1875 to fourteen million bushels in 1880—a thirtyfold increase.

In building construction the use of beams with brick arches began in 1857 with the erection of Cooper Union in this city, but the true steel frame "sky scraper" is a much more recent development. It is practically contemporaneous. The steel frame is essential to the high buildings which are demanded for business purposes where land is valuable. Why land should ever become less valuable is not evident. Neighborhoods may change and values decline locally but there is likely always to be somewhere land too valuable to carry buildings less than 150 to 300 feet high or even higher. It looks as if the steel structural shape was as near permanent as anything now known—unless, indeed, monolithic construction in reinforced concrete shall displace everything else now used in the way of building materials. However, prophecy has no part in this review.

To one with a fancy for unprofitable thinking it may furnish entertainment to speculate, in the light of this brief review of what has happened since 1855, what would be the conditions in manufacturing, business and social life if it could all be blotted out. Perhaps it would be as easy to imagine that "Chaos is come again." And yet nearly everything mentioned in the preceding pages has been a matter of experience with many who read this retrospect, as it is to the writer.

Fifty Years in Iron and Steel.

What has happened in the iron and steel trades since *The Iron Age* was founded will perhaps best be appreciated when it is remembered that the first patents for the production of pneumatic steel were issued to Henry Bessemer in that year—1855. If it were necessary to write the history of 50 years in 20 words these would be the ones best suited to tell the whole story.

As is usual with epoch-making inventions, priority in the conversion of iron into steel by what has come to be known as the Bessemer process was contested. With this discussion we have little to do, except to say that an American inventor, William Kelly, was successful in an interference with the Bessemer patents and in establishing by legal decision his priority of invention in that process. The Kelly patent was granted in 1857. The fact remains, however, that all of the honor and most of the profit of successful invention in this line have been accorded to Sir Henry Bessemer. Some share in both belonged to Robert Mushet, who in 1856 consummated the Bessemer process by adding spiegeleisen to the charge in the converter, thus restoring the eliminated carbon in fixed proportions and reducing the oxygen. To have stopped the blow at the right point to leave the percentage of carbon required would have been difficult in practice.

It is characteristic of the vigor with which the American man of business takes hold of a promising proposition that the development of the Bessemer process was more rapid in this country than in the home of its birth. The volume of production was not as large here as in England for many years, but the practice was better. About 1870, when A. L. Holley was in England, he described to a prominent iron master the work of the Bessemer plant at Troy and pointed out wherein American practice was better than the English. After hearing all

he had to say the Englishman expressed his gratification and remarked that he would like nothing better than to sit on an ingot mold and watch the operation of an American plant. Holley's reply was entirely characteristic and within permissible latitude accurately descriptive of the method in steel making with which he was familiar. Said he: "You would find it interesting, but if you want an ingot mold cool enough to sit on you will have to bring it with you."

It would perhaps be a waste of time at this late day to discuss the importance of the Bessemer process in its influence upon national development and the progress of civilization. Its especial significance in this sketch is that it and *The Iron Age* came into existence in the same year. What has happened in 50 years may well excuse what some of our readers complained of as late as 1868 or 1869—the considerable share of space in our columns given to the nascent literature of pneumatic steel.

The open hearth steel furnace reached this country in 1867 and in that year was erected at Trenton, Nashua and Pittsburgh.

For some years before 1855 the improvement of the blast furnace had received intelligent study from the most capable metallurgical engineers of the period. Neilson's hot blast was developed in 1828 and made the competition of stone coal with charcoal possible. The first American hot blast stove was built at Oxford Furnace by William Henry in 1835. This type, made with arched cast iron pipes, continued in use from 1840 to 1861, when Samuel Thomas of Hokendauqua made his great and useful improvement. In 1867 the English stove of John Player was introduced into this country at the anthracite furnace of Moorhead & Co. at Conshohocken. The Whitwell fire brick stove was introduced at Rising Fawn and Cedar Point in 1875. The Siemens-Cowper-Cochrane stove was first built here at Crown Point in 1877.

The first really efficient and powerful blowing engine in a blast furnace was built by David Thomas at Catauqua in 1852. These dates are given to show that the blast furnace was a construction to be taken seriously when *The Iron Age* was begun. However, in 1855 there were only 26 coke ovens at work in the Monongahela Valley, and less than a hundred in all western Pennsylvania. The first use of Connellsville coke in a blast furnace was in the Clinton Furnace of Graff, Bennett & Co. in 1860.

The American Blast Furnace.

The history of the blast furnace, while it would not include all of metallurgical progress, would perhaps typify it better than any one item. Previous to 1855 nearly all the blast furnaces in operation depended chiefly or wholly upon charcoal as fuel, and were operated by cold blast developed in compressors actuated by water power. The number of anthracite furnaces was relatively small, but their greater capacity accounted for the fact that in 1855 the output of anthracite iron for the first time exceeded the total make of charcoal pig. The output of iron melted with bituminous coal or coke did not overtake the charcoal product until some 14 years later.

The original anthracite furnaces were not very different in construction from those built for charcoal. Indeed, they more resembled lime kilns than modern furnaces, with their massive stone constructions, iron braced, as high as the judgment of the engineers of that period deemed safe, and narrow in the boshes. The inwall was lined with soapstone or fire brick and terminated at a tunnel head plate, through the opening of which the furnace gases escaped, until it was found economical to divert these in whole or in part under boilers or into

ovens, placed at the level of the furnace throat. The modern metallurgical engineer may well stand appalled at the waste of that period in furnace gases, which flamed from the tunnel head in great torches 15 to 30 feet high, and at night lighted the surrounding country. The blowing engines of the time had leather backed pistons moving slowly in wooden tubs, which moaned and squeaked dolefully and gave out a monotonous song which more resembled the wail of the Banshee than anything natural. Furnaces 45 to 60 feet high and 12 to 14 feet at the boshes were deemed monumental plants, and an output of 25 tons of pig per day set the pace which every furnace manager was ambitious to follow. Furnace management was then largely empirical. The manager used what he deemed the best ore available, and having made his iron broke the pigs and sold it by fracture, practically without guarantees and certainly without reference to specifications. If it worked well in foundry or mill everybody was satisfied; if not, nobody knew why, but the agent had to find other customers. The quality was largely designated by such general descriptive terms as, "cold short," "red short," "neutral," &c.; hardness by "gray," "white" and "silvery." Irons suitable for the foundry were designated by numbers 1, 2 and 3, and those which the foundryman did not want were divided into two general classifications of "gray forge" and "mill iron."

Transportation being at that time an element of first importance as affecting the economies of production most furnaces were located conveniently near their sources of ore and fuel, and in assembling these were chiefly dependent upon canals and haulage in wagons. This did not give the manager a very wide range of choice of materials, and when he varied from what he was used to he commonly made a mistake and had to sit up nights with a "sick furnace" or pull it down to remove the skull, due to causes he guessed at but was rarely sure of.

Between 1855 and 1875 the progress in pig iron manufacture was largely expressed in the adoption of better types of furnace construction. The great stone stacks were replaced by cylindrical shafts of fire brick banded with iron. These in turn gave place to furnaces with plate iron shelves, supported on iron columns. This change permitted the height of the stack to be increased and also gave greater diameter at bosh, and they were operated more readily than their predecessors had been on account of the greater volume of steadiness of blast. Tuyere diameters were increased, placed at greater elevations above the hearth and projected into the crucible to protect the walls. Boshes were steepened and the zone of fusion was protected by cooling appliances. Closing of the tunnel head by the bell and hopper and utilization of furnace gases in hot blast ovens of better type effected important economies. It was no longer profitable to depend upon water power to actuate pumping engines and the matter of haulage ceased to be of consequence. The growth of the railroad system permitted ores, fuels and limestone to be drawn from greater distances and with wiser selection.

Then came the era of chemistry as applied to problems of the blast furnace. The prudent manager soon discovered that it paid him to know what went into his stack if he expected to know what would come out of it. Under the empirical system of working it was necessary to smelt or consume 5 or more tons of raw material for each ton of iron tapped. How this compares with the average furnace practice the intelligent reader probably knows.

The changes thus noted in outline naturally affected in an important degree the cost of pig iron. Probably

as good practice as the country then could show was that of the Thomas Iron Company, at Hokendauqua, Pa. In 1855 it required 2 tons and 968 pounds of coal to produce 1 gross ton of pig iron. In 1855 the allowance of limestone per ton of iron was 1 ton and 1427 pounds. John Birkinbine, from figures collected for *The Iron Age* in 1896, compiled the following table, showing the cost of pig iron in the Lehigh Valley as an average for the six months ended December, 1855:

	Cost per ton.	Amount used per ton of pig iron.		Cost per ton pig iron.
		Ton.	Lbs.	
Coal	\$3.10	2	968	\$7.55
Ore	3.59	2	1,252	9.50
Limestone .....	.63	1	1,357	.98
Labor and repairs.....	...	..	....	2.54
Total.....	...	...	....	\$20.57

The same authority said, in the review referred to:

"The above summary, while merely suggestive of the advances in pig iron manufacture for 40 years, shows the changes in dimensions, form of structure and the equipment of furnace stacks, the augmented output of iron, the marked economy of operation and the adherence to requirements of purchasers. Our pig iron industry has not developed by multiplying plants, but by improved practice. The large stables, which were a necessity for nearly every blast furnace in 1855, to accommodate a hundred or more draft animals, have been supplanted by moderate sized locomotive houses; the flaming tunnel head has been extinguished and gases utilized to heat the blast and supply steam; the bridge house connecting the tunnel head to a nearby bank has been displaced by steam elevators; the small wooden casting houses have grown into large iron and brick structures. The blast of 1000 to 3000 cubic feet per minute delivered at from $\frac{1}{4}$ to 5 pounds pressure and from atmospheric temperature to 600 or 900 degrees F. has been intensified until it is now supplied at from 100 to 1500 degrees F. under pressures of from 10 to 15 pounds per square inch, and in volume exceeding 30,000 cubic feet per minute to one furnace stack. The clinder, instead of being dragged from the tump by long hooks in the keepers' hands flows into ladle cars, which are hauled to the dump by locomotives, and at the large steel works much of the iron made is similarly handled in the liquid state. The ore and flux, which were prepared by hand hammer or thrown into the furnace in great lumps, are now reduced in size by rock breakers, and in all parts of the furnace plant and in transporting materials labor is economized, until to-day in making a given quantity of pig iron but one-fifth the labor is necessary that was required 40 years ago."

Progress in furnace practice since 1896 has been in details rather than in great and revolutionary changes. They are, however, expressed in economies which, if it were deemed worth while to give so much time to contemporaneous conditions, would make the comparison even more striking than it appeared ten years ago.

The bloomery and Catalan forge were passing into disuse in 1855, though examples might be found in the woods in profitable operation. But the puddling furnace was still a great institution, and as late as 1877 the editor of *The Iron Age* was proud to admit that he had rabbled a heat and got out the ball without destroying the furnace lining. He could scarcely be called a practical puddler. It looked then and looks still as if the puddling furnace had come to stay. Puddled iron had a great place in the world's work for a full century, but it is as true of metallurgical furnaces as of other things that:

Little of all we value here
Wakes to the morn of its hundredth year,
Without both looking and feeling queer.

With masses as small as those which the puddler could handle not many of the engineering works now undertaken would have been possible. Larger units, however, were not needed until the last quarter of the nineteenth century, and if made would have been out of all relation to the then "state of the art."

It is no part of the purpose of this review to make it a history of the iron and steel industries of the United States through half a century. To do so, even in outline, would require a volume of generous proportions. What is sought is scarcely more than to show at a glance the condition of these industries at the time *The Iron Age* was founded to represent them.

Iron Statistics of 1855.

The statistics of that period are very incomplete and fragmentary and are of doubtful value for the reason that agencies for their collection did not exist, still less for their verification. Even the census reports of 1850 and 1860 give but meager data for estimates of the year lying midway between them. The 1850 census showed that there were then in the United States 377 blast furnaces with an aggregate capacity of 563,755 long tons of 2240 pounds. This was assumed to be the product, but in view of what is remembered of blast furnace practice at that time the assumption is a violent one. We have, however, no idea what allowance to make in estimating the actual product. There were in that year, also according to the census, 552 plants in the United States making wrought iron in some form. The tonnage of wrought iron produced is not given, but its value was estimated at \$22,629,271.

The census figures for 1860 are somewhat fuller, but whether any more trustworthy is a matter of conjecture. They show in that year 286 blast furnaces making 987,559 tons of pig iron, worth \$20,870,120; 97 bloomeries producing 51,290 tons of blooms, worth \$2,623,178; 256 rolling mills producing 513,213 tons of sundry forms of rolled iron, worth \$31,888,705, and 13 steel works producing 11,838 tons of steel, worth \$1,778,240.

Of the iron and steel production in 1855 we know only what can be gathered from unofficial sources and cannot be sure of any of that. The figures given are no doubt largely estimates based upon the census guesses of 1850. However, we conclude from the best information available that in the only two lines concerning which we have any figures for that year, there were produced:

	Tons.
Pig iron.....	784,178
Iron rails.....	138,647
What else was made we do not know. The prices of pig iron, rails and bar iron in 1855 appear to have averaged about as follows:	
No. 1 pig, anthracite.....	\$27.75
Iron rails.....	62.87
Best refined bar iron.....	91.33

These are very meager figures, but to get them has involved no little research. Half a century ago not much importance attached to industrial statistics. Writers who discussed such subjects were content with generalizations. Whether exaggerated or diminished probably depended a good deal upon the point of view.

The Iron Works of 1855.

Small as it now seems the iron industry of 1855 was deemed very important; and so it was, relatively to other industrial developments. A writer whose modesty in concealing his name has deprived him of posthumous honors said in an essay on the growth of iron making in this country, published in 1855:

"Never was this industry so prosperous as now or its future so radiant with promise. The Iron Crown of industrial supremacy is settling upon the brows of this

young Republic. Europe has practically exhausted its supply of desirable ores, and the same is true of its coal seams of quality suitable for the smelting of ores. Those of England are inferior, and it is only by the exercise of great skill and much expense in repeated refining that iron of even tolerable quality is made there. Some fairly good ores are to be found on the Continent, but France and Germany have only poor grades of coal, not well adapted to metallurgical purposes, and when the nearly depleted forests of that country shall cease to yield charcoal and the nobles drive out the charcoal burner that their pleasure in the pursuit of the deer and the wild boar may not be disturbed, the iron of the Continent, now very inferior, will still further deteriorate. Good iron can be made in Russia, but its mines are so remote from its ports that the greater part of two summers is needed to effect its transportation to the seaboard. With exhaustless supplies of the richest and purest ores and the best of coals in equal abundance, the United States are destined to be the source of supply of iron and steel for the whole world."

The prophets of the industrial future were optimists in those days.

Tool Steel.

Steel making was considered an important industry in 1855, but not important enough to be included in the census tables. Among the firms prominent in the business were James Rowland & Co., J. Robbins, Earp & Brink, Robert S. Johnson and H. & H. Rowland, all of or near Philadelphia; R. & G. D. Coleman, at Martie; H. & W. Coleman, at Castle Fin; Singer, Nimick & Co., Jones & Quigg, Spang & Co., G. & H. Shoenberger and S. McKelvy, of Pittsburgh, and the Adirondack Iron & Steel Company of Jersey City. Possibly there were a few others who had passed beyond the experimental stage of whom we have found no record. Most of their product, which it is probable did not exceed 1000 tons altogether, was blister steel. The earliest cast steel of good quality made in this country is believed to have been made in 1852 by McKelvy & Blair, in Pittsburgh, but their facilities were small. Singer, Nimick & Co. took up the making of crucible steel in 1853 and Isaac Jones in 1855. The first output of American tool steel of high quality is attributed to Hussey, Wells & Co., and was made in 1860 from American iron. Park Bros. entered the business in 1862. From that time its development was rapid.

The Hardware Trade.

The importance and value of *The Iron Age* in the development of the hardware industries of the United States has been so great and so continuous during 50 years that a historical retrospect, however fragmentary, would be without interest if some mention of the great changes which this period has witnessed in hardware production and distribution was omitted.

In this country the wars of the Revolution and of 1812 tended powerfully to foster among those who were engaged in the upbuilding of the nation the idea of industrial independence. This motive led to a great deal of enterprise in the diversification of the manufacture of metals, and by 1850 the hardware business has become important in what was then relatively a large, but would now be considered a small, way. To determine what magnitude it had reached in 1855 would be impossible, but it can be rudely approximated by taking the census tables of 1850 and 1860, calculating the average annual increase in output during this decennial period and adding to the figures for 1850 the assumed increase of five years. By this method we conclude that in its prin-

cipal items hardware manufacture in the United States in 1855 was about as follows:

Articles.	Plants.	Capital.	Hands employed.	Value of product.
Agricultural implements..	1,493	\$4,286,042	8,640	\$8,212,000
Pumps	244	407,638	920	1,055,625
Brass castings.....	177	1,902,110	2,014	4,350,618
Britannia and plated ware	109	710,580	1,532	1,942,918
Brooms	364	379,185	1,421	1,130,761
Brushes	176	851,800	2,900	1,888,298
Copper and brass goods...	210	3,420,981	2,850	5,931,481
Cutlery and edge tools....	481	2,780,074	5,118	4,575,891
Earthen ware.....	35	69,290	167	120,679
Guns	381	692,011	1,857	1,407,619
Bullders' hardware.....	410	4,246,830	8,430	8,349,324
Miscellaneous iron manufac-				
tures	114	724,560	1,299	1,740,413
Nails	105	5,314,197	6,280	9,194,574
Splice nails	11	77,300	67	298,086
Tin and sheet iron manufac-				
tures	2,734	5,055,505	9,200	10,719,865
Wire and manufactures of	98	645,270	815	1,239,901
Wooden ware.....	236	436,198	1,632	1,365,694

It is not claimed that this tabulation is accurate. The census figures for 1850 are admittedly incomplete and imperfect. Those for 1860 were fuller and perhaps more accurate, but were still incomplete. However, these census tables are the best data available, and no better method of estimating the magnitude of the industries tributary to the hardware trade than that employed has suggested itself. In items above enumerated it will be seen that in comparatively few lines was hardware manufacturing relatively important in this country in 1855, but it had made a good beginning. The reminiscences of John W. Quincy of New York, who had been all his life in the hardware business, first in Boston and then in this city, are especially interesting. His statement was prepared about 1863, and summarizes a personal experience dating back to almost the beginnings of the trade in this country. Mr. Quincy says that about the year 1827 or 1828 Amasa Goodyear, a manufacturer for many years of hay forks, buttons and other articles at Salem Village, near Waterbury, Conn. (who had been accustomed to take orders by semiannual visits to the city, storing his goods in the warehouse of David W. Prescott), opened in Church alley in connection with his son, the late Charles Goodyear of India rubber celebrity, and under the management of the latter, a small store, which it is believed was the first in the United States for the sale of American hardware. A. Goodyear & Son having failed through speculations of the junior partner in real estate, the business in January, 1831, passed into the possession of Messrs. Curtis & Hand, by whom it is still conducted and who exerted themselves to give currency to various articles of home manufacture. About the former date the business was also commenced in New York by Christopher Hubbard, afterward Casey & Hubbard, who were followed in 1829 by George H. Grey & Co. and Hasner & Green of Boston. At that time there was but one hardware store in the country 100 feet in depth, those of 40 x 60 feet being considered first-class stores and a rent of \$1000 a year rather a high one.

The number of articles of domestic hardware kept or to be obtained by the largest dealers was quite limited and embraced many small articles, as shell and other buttons, which have since passed to the other branches of trade. Among the articles kept by the earliest dealers were Goodyear's patent molasses gates, Fenn's patent cock stop and leather faucets, cast bits and screws (not very salable), nail, shoe and side strap hammers (among which those of Charles Hamond of Philadelphia and Mr. Eastman of Concord, N. H., were well known), wooden awl handles, Roland mill saws, the circular hand saws and wood saw webbs of Welsh & Griffiths of Boston (whose brand was already in repute), spinning wheel heads of home invention, Britannia wares, carpenters'

planes, stable and hay forks, shovels, scythes, &c. Even all of these did not come into use as early as 1828 or 1830, but the list of American articles purchased and sold by hardware dealers at the close of 1834 embraced the following goods, furnished by Mr. Quincy from a record before him. Some of these articles were still more or less largely imported as well as made here: Iron and brass wire sieves, cotton cattle and wool cards, board coffee mills, brass andirons, brass head shovels and tongs, cast circular gridirons, bung borers and reamers, iron ware, Britannia tea and coffee pots, wood faucets, wheel heads, hoes (not planters'), scythes, cow bells, japanned lamps, black ball, bull's-eye and dark pan hand bells, pewter faucets and molasses gates, mackerel and small hemp lines, window cord, coil rope of hemp and Manila, brushes (scrubbing, floor, paint, furniture, horse, shoe, hair, varnish, dust, sash and hearth), sand boxes, scale beams, iron stands, sleigh bells, rawhide, ink stands, counter scales, board rules, gauging rods, pocket rules and fourfold, Britannia tumblers and ladles, whip thongs, mouse traps, guns, bellows, coopers' axes, adzes and drawing knives, steelyards, cut tacks and brads, sheet nails, patent awls, iron candlesticks, mahogany knobs for drawers, steel squares, brass spring door catches, screw drivers, awl hafts, mincing knives, spring shoe punches, gimlets, copper braces, gut and bone whips, japanned door latches, circular saws, glass knobs, timber scribes, shingling, lath and axe hatchets, scratch awls, hooks and eyes, silver pencil cases, razor strops, screw augers, auger bits, pocketbooks, lead pencils, bone, mold and suspender buttons, soap, axes, waffle irons, oilstones, bind-fasts, mill cross-cut and tenon saws, stable and hay forks, shovels, spades, glue, carpenters' tools, sad irons, Bristol brick, cast iron cart and wagon boxes, scythe rifles and wood saw frames.

These intimate details of the business at a time long antedating the memory of any living man are of unusual interest. The list covers practically everything the enterprising hardware merchant was able to handle in his business, whether of imported or of domestic production.

During the first half of the nineteenth century only a small part of the hardware required for use in the United States was of home manufacture. Generally speaking, however, that made at home was of better quality than that imported from abroad. As our requirements became specialized the need of distinctly American patterns became evident and concerns were established to meet this want, many of which are still carried on by the successors of their founders and some with the names under which they began. The value of a historic name is more appreciated now than it was 25 to 50 years ago and those who displayed conservatism in retaining trade designations which have become venerable have cause for congratulation.

Naturally the industry of hardware manufacturing had its beginnings in New England. No other section possessed the advantages then offered by the Eastern States in transportation facilities, skilled labor, supplies of materials and manufacturing experience. The business gradually spread over into the Middle States, especially New York and Pennsylvania. For many classes of goods New England still holds pre-eminence, but no longer monopolizes the advantages which were once exclusively her own.

In the beginning there was little opportunity for successful competition in a large way between domestic manufacturers and the importers in meeting the demands, for the cheaper grades of hardware. American ingenuity in the development of new ideas under the encourage-

ment of our system of patent laws met this difficulty by providing novelties which better met the domestic need than did the standard patterns of Europe. From the point of view of the typical importer and jobber the domestic manufacturer was an intruder in the field and it may be assumed that he found little encouragement in securing representation in the established agencies of distribution. The great houses of New York, Philadelphia and Boston and their connections in the other large business centers were relatively heavy importers and counted as an asset of first importance the control of desirable foreign lines. As late as 1858 a hardware dinner was given in New York under the auspices of the Hardware Dealers' Board of Trade. At this dinner there was much speaking in response to toasts, but not until the twelfth on the list was the American manufacturer mentioned. By that time the hour must have been late and it was probable that few cared to listen to the speech called out if, indeed, it was responded to at all. If one with prophetic far-sight could have read the future to that company he would probably have been hooted to silence and led out to the sidewalk to cool his fevered brain in the night air. It is now many years since the American product pushed its foreign competitors from the dealers' shelves. It is just about 50 years ago that the New York Hardwaremen's Board of Trade, impressed with a realizing sense of the fact that it would not do to permit American manufacturers to become known by name to dealers, deemed it expedient to boycott those who did not conform to the rule to efface themselves and become mere adjuncts to the established system. Finding that by his enterprise in sending out representatives of his own with samples of his products the domestic manufacturer was getting orders and doing business with the retailers to an extent that threatened a serious disturbance of the plans of importers, meetings were called to discuss the situation, with the result that the following resolution was adopted and distributed as a warning circular signed as indicating approval by nearly all the houses represented in the board:

CIRCULAR.

AT A MEETING OF THE HARDWARE DEALERS' BOARD OF TRADE,
of the City of New York,

It was unanimously

Resolved, That in ordering goods from the manufacturers of American hardware we will, as far as practicable, have the name and residence of the MANUFACTURERS left off, both from the articles and labels, or if it be desirable to have the makers thereon that we will in all cases request that the makers' residence be left off, both from the article and label.

Resolved, That we will give our patronage in preference to such persons or manufacturers as favor our views, and who decline or discontinue to interfere with the regular course of trade.

Extract from the minutes.

ED'D CORNING, President.

JOHN DAVENPORT, Secretary.

Approved.

ED. CORNING & Co.,
WM. N. SEYMOUR & Co.,
CLARK, WILSON & Co.,
CHURCHILL, ROGERS &
WETMORE,
BLIVEN & MEAD,
J. DAVENPORT & Co.,
C. B. CONANT, DODGE & Co.,
BOYD & KEEN,
LOGAN & LIDGERWOOD,
JOHN W. QUINCY,
HENRY CROMWELL,
SACKETT, LYNES & Co.,
FOX, OAKLY & MORGAN,
CHARLES S. LITTLE & Co.,
HENRY C. CARTER,
FARNUM & WEEKES,
THOMAS DOUGLASS,
SAMUEL ROOSEVELT,
PETER DURYEA & Co.,
WM. H. LIVINGSTON & Co.,
WILLIAM WAY & Co.,
TOWNSEND, CLARK & Co.,
ALFRED F. LAGRAVE,

JOHN C. TUCKER & Co.,
NORTON, JEWITT & BUSBY,
NEILSON, VARDELL & Co.,
BALDWIN, HILL & Co.,
JOSEPH H. ADAMS,
HOWE, BROWN & Co.,
BOYD, WILKINS & Co.,
BRUFF BROS. & SEAVER,
ISAAC L. HUNT,
MANT, BALDWIN & MANT,
JOSEPH H. WESTCOTT,
RICH & FLEURY,
SHELDON, HOYT & Co.,
OSBORN & SWAN,
NIDENFIELD & COHN,
COFFIN, BRUCE, BISHOP & Co.,
GEORGE H. SVOIDS,
JACOB HALSTED,
SEARS, ADRIANCE & PLATT,
SMITH & VAN HORN,
WOLFE, DASH & FISHER,
A. L. HALSTED & SON,
SHERMAN BROS.,
T. NEURES & SON.

The publication of this circular in the *Hardware-*

man's Newspaper, with appropriate comment, did much to precipitate the crisis it was destined to avert, as it forced a closer alliance between the manufacturer and merchant in opposition to the importer and jobber. The alliance of this journal was then what it has ever since been with those laboring to build up American industry. The tone of our editorial comment on the movement referred to in the circular above quoted may be judged from the following extracts from one of our issues of 1856:

"Our opposition is not to jobbing in itself, but to the centralization of it. We do not object to the production of the manufacturers being sold in smaller quantities by wholesale merchants to suit the wants of smaller dealers. On the contrary, we maintain that this system of business may with great advantage be generally introduced, and that small buyers may most commonly furnish themselves with goods with greater economy and convenience from large dealers in their neighborhood than from manufacturers at a distance.

"The first grand result would be the localization of the jobbing trade. Instead of New York, Boston and Philadelphia being the great markets of the country to which dealers of all kinds, large and small and from all parts of the country, repair for their supply of hardware, we should have in the center of every important district of the Union merchants engaged in buying and selling goods on just as good terms as their Eastern competitors. And why should it not be so? Why should not the merchant of Mississippi, equally solvent and punctual, buy his goods on just as good terms as a merchant on the banks of the Hudson? Why should not a respectable dealer in Wisconsin or Iowa or Illinois wholesale his goods just as favorably as one in Boston or New York or Philadelphia? Why, then, should the merchants of the West uphold the monopoly of these Eastern traders and strengthen and consolidate by their support and sanction a system disastrous to their own interests?

"The legitimate jobbing business could be much better done by local merchants scattered through the country than by men residing at a greater distance off. The class who are the proper customers of such merchants are small buyers, whose stocks are too small to render it advantageous to purchase from the makers. The nearer the markets such buyers may be and the greater the facility they may have of getting supplies of goods in small quantities the more advantageously and safely can their business be done. Instead of making semiannual journeys to New York and loading themselves with liabilities for unnecessary quantities of goods such parties, if they had their markets close at hand, could be constantly supplied just according to the demands of their trade."

This indicates sound business judgment and a clear comprehension of the tendencies of an effort which, however strongly supported, was destined to suffer a complete collapse. The incident is instructive as showing how little real significance attaches to "conspiracies in restraint of trade." They often look very formidable, but they do not stand the test of time.

The first and most conspicuous effect of increasing competition between the manufacturers and the importers to control the trade of the country was to break down the price of hardware all along the line. This tendency has continued ever since. Not, as at the outset, the result of competition between American and foreign goods, but in consequence of the enormously cheaper competition of American products one with another. Costs have been cheapened by the substitution of machinery for hand labor in every operation which admits of mechanical performance. What had happened in 40 years after

1855 was well set forth in a general discussion of this subject in *The Iron Age* in 1896, which states the facts as they appear to-day almost as fully and accurately as if written now:

Methods of Manufacture.

"Very marked has been the progress which the country has made during the last half century in the direction of improved methods of manufacture. This has had the result of reducing the cost, increasing the number and improving the quality of goods. We cannot do better than refer in the most general way to the changes which have taken place in this regard, principally through the introduction of machinery by which almost all the tasks previously done by hand are accomplished automatically, with the least possible expenditure of labor and the greatest exactness in the product. It is a record of the triumph of invention as applied to machinery.

"A few illustrations will merely indicate something of what has taken place in almost every line of goods. Files, cut by hand before the sixties, are now almost exclusively made by machinery, at a fraction of former prices; cooking, kitchen and various utensils are now largely stamped from one piece of metal, doing away with soldering and riveting seams; drop forgings enter into the construction of many articles, and enameled ware is now made in enormous quantities by intricate machinery. Many manufacturing plants are equipped with electricity for power, heating and lighting. Petroleum is largely used for fuel, and natural gas has largely come into use and manufacturing concerns have moved into districts where it can be obtained. More attention is given to the surroundings of mechanics working in shops and their comfort and welfare are more regarded than formerly. It is a custom for shrewd and farsighted manufacturers to discard a machine or tool whenever they are convinced that something better is obtainable, the aim being to get the largest result at the least expenditure of time and labor.

"Shop methods and elaborate systems, the growth of experience, have been evolved, replacing the careless and shiftless practices of earlier times. Consolidation of interests and the establishment of extensive factories have contributed much to enlarge facilities. Chemistry and research have revealed new uses for what had long been regarded as waste materials. As a result of all this goods are produced more cheaply and with greater exactness in construction and in most instances of improved quality, while at the same time they are better finished and more attractively put up, thus rendering them more salable.

"Many other examples will suggest themselves to our readers which would serve as illustrations of the wonderful progress and matchless development of manufacturing methods during the latter half of the century."

In a review intended to be largely an exchange of congratulations with such of our readers as feel an interest in our anniversary celebration it is perhaps as well not to give too much space to the story of difficulties encountered and surmounted. But the publishing and editing of *The Iron Age* has been at times confronted by grave difficulties, its policy of assisting in the upbuilding of American industries has encountered bitter and persistent opposition from interests unfavorably affected thereby, and there have been periods in its history when it appeared to have very little in its favor except the fact that it was right and consistent in its devotion to a sound principle.

The movement of 1856 to boycott the domestic manufacturers who put themselves in the way of becoming

known to retailers by using their name on their labels was followed nearly 30 years later by an attempt to boycott *The Iron Age*, with a view to forcing it to suspend the publication of price-lists and discounts. This movement was initiated and engineered by jobbers who deemed it inconsistent with their interests that the hardware dealer should be advised as to trade happenings or know more than it suited them to tell him. Finding it impossible to suppress the information which they desired withheld a plan was organized to destroy *The Iron Age* by frightening manufacturers into withdrawing their advertising. The penalty of refusal on their part was to be that the jobbers would discriminate against their goods and give preference to those of makers more obedient.

This movement was surrounded with great secrecy, but to reach the interests which it was desired to impress it became necessary to send out a "confidential" circular giving full particulars. A copy of this was promptly sent to *The Iron Age*, where it was received with no obligation of secrecy and no disposition to regard it as confidential. It was immediately republished in our columns with the names of the signers. The editorial comments upon this movement and its tendencies were calm and conservative. It was pointed out that while it might be possible greatly to embarrass *The Iron Age* by restricting or possibly destroying its business no good result would come from so doing. As long as there was trade news to print which somebody wanted to read it would in one way or another get to those who wanted it. The harder it was tried to suppress it the more interest it would have. While the jobbers might proclaim *non fiat Lux*, it was impossible they could ever complete the paraphrase and add *et Lux non fuit*. It was a very temperate discussion, everything considered. It was unnecessary to get excited at this end of the line, especially as a majority of the manufacturers who found our columns useful preferred alliances with the merchants to those which the jobbers were in a position to offer them, and the movement was foredoomed to inglorious failure. Publishing the circular robbed it of all power for harm. The retailers throughout the country perfectly understood what it all meant and what would happen to them if the jobbers succeeded in accomplishing their purpose. They took the matter up with interest, and entered a vigorous protest against any plan looking to the suppression of trade information. It all ended in the appeal of the jobbers to *The Iron Age* to drop the discussion, as the feeling against those who had signed the circular was so strong as to menace them with a boycott initiated by the hardware merchants. The wounds of this struggle are long since healed. *The Iron Age* has never had any quarrel with the jobbers, and in a thousand ways has been of vast service to them. It has at times had to put itself in opposition to movements based upon a misconception of the best interests of the trade and has never suffered from so doing.

To say that the conductors of *The Iron Age* welcomed this or enjoyed it while it lasted would not be true. Peace and good will have always been more agreeable to us than strife and contention, and even the satisfaction derivable from the consciousness of being right has not compensated for the disagreeableness of disputation. But from this effort on the part of the jobbers to restore conditions which the trade had outgrown came a great and lasting advantage to *The Iron Age*. The relation between this journal and the hardware merchants throughout the United States was cemented by the recognition of a common interest. This has never since been lost sight of, and every year since has but strengthened the bond.

The changes of half a century in the hardware trade of New York have been too complete to be noted other than by broad contrasts. In 1853 this city was the undisputed center of the trade and its merchants expected it would forever remain so. Here were located a majority of the great importing houses, and here also were founded and flourished the jobbers who distributed to the retail trade. With the growth of the country new centers were created, which in their respective spheres of influence were more useful than New York, and it is no longer pre-eminent nor of controlling influence in the trade. Strong and enterprising concerns sprang up wherever there was business for them, and in a number of instances these houses have become the greatest in their line in the world.

Trade methods have also changed radically. There are still many who remember very well when the retailer came to New York twice a year to select and purchase his stock. These visits were events in the lives of those who made them, and kept the resident merchants busy with hospitable duties. Trips of this sort are now very rarely made. The retailer remains at home attending strictly to business and content with the diversions of his own town, and is visited to his satisfaction and sometimes overvisited by traveling salesmen. To say that it requires a higher order of talent to be a successful traveling man in hardware than it did to be a great merchant of the old régime may or may not be true; but it was "no trick" to sell goods to a merchant who came after them and must have them, especially when the range of choice was small. It is something very different to go to a man who does not expect you and perhaps does not want to see you, secure and hold his attention, interest him in new things, satisfy him as to prices and get his order. But these are the commonplaces of the business which everybody knows.

The Hardware Department.

The Hardware Department of *The Iron Age* has been an evolution through half a century. For reasons already stated comparisons of one period with another separated from it by the lapse of years would be futile. What is now within the scope of legitimate and even conservative newspaper enterprise in trade journalism would have been perhaps impossible and certainly unprofitable alike to publisher and readers at some previous time. Originally all the matter specially prepared for *The Iron Age* in the way of trade literature was supposed to be of exclusive interest to the hardware trade. As its horizon broadened it was found that a great many subjects claimed consideration which needed equally intelligent attention and that the specific literature of hardware was best presented by making it a department by itself. In recognition of this fact it has, as far as possible, been conducted upon somewhat different lines from those followed in the development of other departments.

The first hardware editor of *The Iron Age* was Strickland K. Marks, elsewhere mentioned at some length. With the death of that gentleman its control was given to Richard R. Williams, by whom it has since been conducted. The special knowledge required for this department is of a very different kind from that called for in the successful conduct of a great newspaper of general iron and steel trades information. By reason of this specialization the Hardware Department of *The Iron Age* has attained unique value and importance. The accuracy of its reports, the completeness of its price-lists and the variety and value of its special trade literature have for many years distinguished it. That it did not

grow in a night, like an Oriental gourd, but was the creation of many years of patient and thorough work directed solely to the greatest good of the interests it represented and for which it speaks, a search of our files for half a century would show.

Commercial News and Trade Newspapers.

Trade journalism had its beginnings about the middle of the nineteenth century. Commercial journalism began much earlier. The need of newspapers of this class, if it existed prior to 1850, was not generally recognized, and an unrecognized want is as nearly nonexistent as possible. The point of view of the general newspaper was very different in 1850 from what it now is. With a comparatively infrequent transatlantic service and dependence upon the mails for news of all kinds, the most enterprising and successful journalism was that which magnified local incidents. The reporter was then the most important man on the staff of a newspaper and most of the great editors of the last quarter of the last century were trained in that hard service, for which only men of exceptional capacity were fitted. To be a good all-around reporter demanded the highest journalistic talent, expressed in keen perception, the power of rapid and accurate generalization and a literary facility which could turn out copy with lightning rapidity and without the mechanical aids of stenography and the typewriter. To write forcibly and accurately and make a "story" which sustained its interest to the end without flagging, while the presses were held waiting and the printer's "devil" stood at the writer's elbow to snatch the output sheet by sheet, was what the efficient reporter and correspondent must at all times be equal to. Its nervous strain wrecked thousands of young men of genius. The Atlantic cable changed all this. The enormous expenditures of the newspapers for cablegrams necessitated the sharpest economies in local service, and the opportunity no longer existed for the great work which the reporter and special correspondent had done under the old régime. It is not improbable that specialization in journalism was one of the results of this change. Men of large capacity, with the desire for recognition in the field of personal journalism, found more congenial opportunities in founding trade publications than in the subordinate positions of the general newspaper staffs.

In 1855 there were not more than 3000 current publications of all kinds in the United States. This included monthlies, weeklies and dailies. The number maintained now somewhat exceeds 30,000. This includes a large number of special trade publications. Practically every industry and subdivision of the field of distribution has its own newspaper and some of them have several. Of these it may be said as of the virgins of the parable—that some are wise and some foolish. This class of publications had its beginnings in the demand for marine intelligence, since the only source of supply for other than farm products of the crudest kind was through importation. It naturally suggested itself to those who endeavored to keep track of arrivals and departures of ships that it would be wise to add a record of the fluctuations of the prices of staple commodities. In 1739 the *New York Gazette* became enterprising and started a price current with quotations for wheat, flour, corn, tea, sugar, molasses, rum and a few other items when information concerning them could be had. The first newspaper of New York to devote itself strictly to business interests was the *Shipping List*, subsequently merged with

the *Price Current*, and now represented by legitimate succession in the *New York Commercial*, a daily paper for merchants in several lines. Boston claims chronological precedence in a newspaper with the impossible name of *Prices Current and Marine Intelligencer, Commercial and Mercantile*. Notwithstanding the handicap of this title, it lived several years. The *New York Journal of Commerce* was begun in 1827. It had vicissitudes, but finally became established in a very substantial way. The subsequent development of what may be called general commercial journalism would have been more important than we find it if it had not been to some extent divided up among the newspapers not strictly commercial. They were long in discovering that accurate and fresh trade information had large news value. The pioneer of strictly specialized journalism in this country was the *American Railway Journal*, founded in 1830. The oldest of the journals addressing one trade is the *Dry Goods Economist*, the history of which epitomizes that of trade journalism in the United States. As it is the senior of *The Iron Age* by a few years we have pleasure in speaking of it particularly.

When the *Dry Goods Reporter and Commercial Glance* was begun is not known even to its present proprietors. No files of earlier date than 1849 have been preserved, and serial numbering was not looked after as carefully as it would have been had its interest for posterity been better understood. It is believed to have been founded in 1847. Its first proprietors were William Burroughs and Robert Boyd. Its name was changed under new proprietorship in 1852 to the *United States Economist and Dry Goods Reporter*. John W. Mackey became its proprietor in 1858. His views of trade journalism were not quite practical, but he did very well for many years, and would have continued to do well had he known enough to adapt his paper to the changing and developing requirements of the trade he addressed. In 1888 he sold his paper to Messrs. Root and Tinker, and it has since developed into a great publication of controlling influence under the name of the *Dry Goods Economist*.

In a review of the development of trade and specialized journalism in the United States embodied in "One Hundred Years of American Commerce" David Williams says with characteristic clearness and simplicity of diction:

"However good a general journal may be it can only cover the whole field incompletely. The last business directory of New York gives nearly 3000 occupations sufficiently large to be carried on in trade or manufactures in offices or shops apart from other business. It might be thought by a superficial observer that these callings could be classed together and that they might be grouped somewhat as they are in the census under manufacturing, commerce, &c. But the commerce in naval stores, for instance, is entirely different from that in dry goods, and the manufacture of shoes has no analogy to that of Bessemer steel. The maker or dealer desires chiefly to know what is going on in his own calling, what others are doing in it, what new things are coming out, what competition he is likely to meet, what the prices are for the goods he handles and what the price of the raw material he needs may be, together with general news of the commercial world. This he requires to be given with fullness and particularity. No weekly or daily can be so planned that it can include this special information among other topics, for the journal would be too large for convenience and the subscriber would care nothing about the remainder of its contents. Trade at the present day is carried on with more accurate knowledge of the sources of supply, the quantities which may be expected, the prices at which an

article is selling, the cost of transportation and the probable amount of competition which will be met than it was half a century since. Every source of competition and supply must be watched by the commercial man of today if he is to be more than a mere retailer, and the knowledge is most surely and amply supplied through a trade journal.

"It is too soon to tell what the future of the trade and technical press will be, but it is apparent to those who are most conversant with its history and who have devoted most study to its details that the development of the past will be continued in the future. Every group of thinkers, every line of trade, every one interested in certain kinds of knowledge will require better means of communication, a more thorough analysis of facts and more certain methods of chronicling the occurrences of the day. Many new lines will doubtless be represented in the press, while it is not unlikely that the increasing demands of both readers and advertisers will drive out of the field many of the weak and questionable publications which are now parading under the banner of the trade and technical press. The pace will be a hard one and only those can keep it up whose business is based on a substantial foundation and managed with unflagging intelligence, energy and enterprise."

The Iron Age.

Its Beginnings—John Williams—David Williams and Associates.

Immediately after the collapse of the abortive attempt in 1848 to establish the political autonomy of Ireland—an attempt which did not attain the proportions or dignity of a revolution, but which more or less seriously compromised with the British authorities a great many patriotic Irishmen—John Williams, originally a hardware salesman, but at that time an editorial writer on the *Dublin Nation*, deemed it expedient to emigrate to America. His activities as a Nationalist had made him *persona non grata* to the Crown and to that extent embarrassed his career. But his chief reason for leaving Ireland was that the political and social conditions existing and established in that country closed every door of advancement to the enterprising and ambitious man. He reached this country alone before the end of 1848, and for some reason not now remembered went to Port Jervis, N. Y., instead of remaining in this city, where the opportunities were apparently much larger and better suited to his capacity.

Naturally he experienced the difficulties and discouragements which attend the educated immigrant without capital or friends. His family had been identified with the iron interests, his grandfather having established in Waterford the first foundry built in the south of Ireland, which at the time of his leaving home was conducted by his mother for the estate of his father, of whom he was the posthumous thirteenth child. As there were many ahead of him in the succession the foundry gave him no opportunity for satisfactory employment. He found his first steady engagement in this country in a small foundry in Port Jervis, of which he quickly became bookkeeper and accountant. In 1851 he sent to Ireland for his wife and five children.

John Williams.

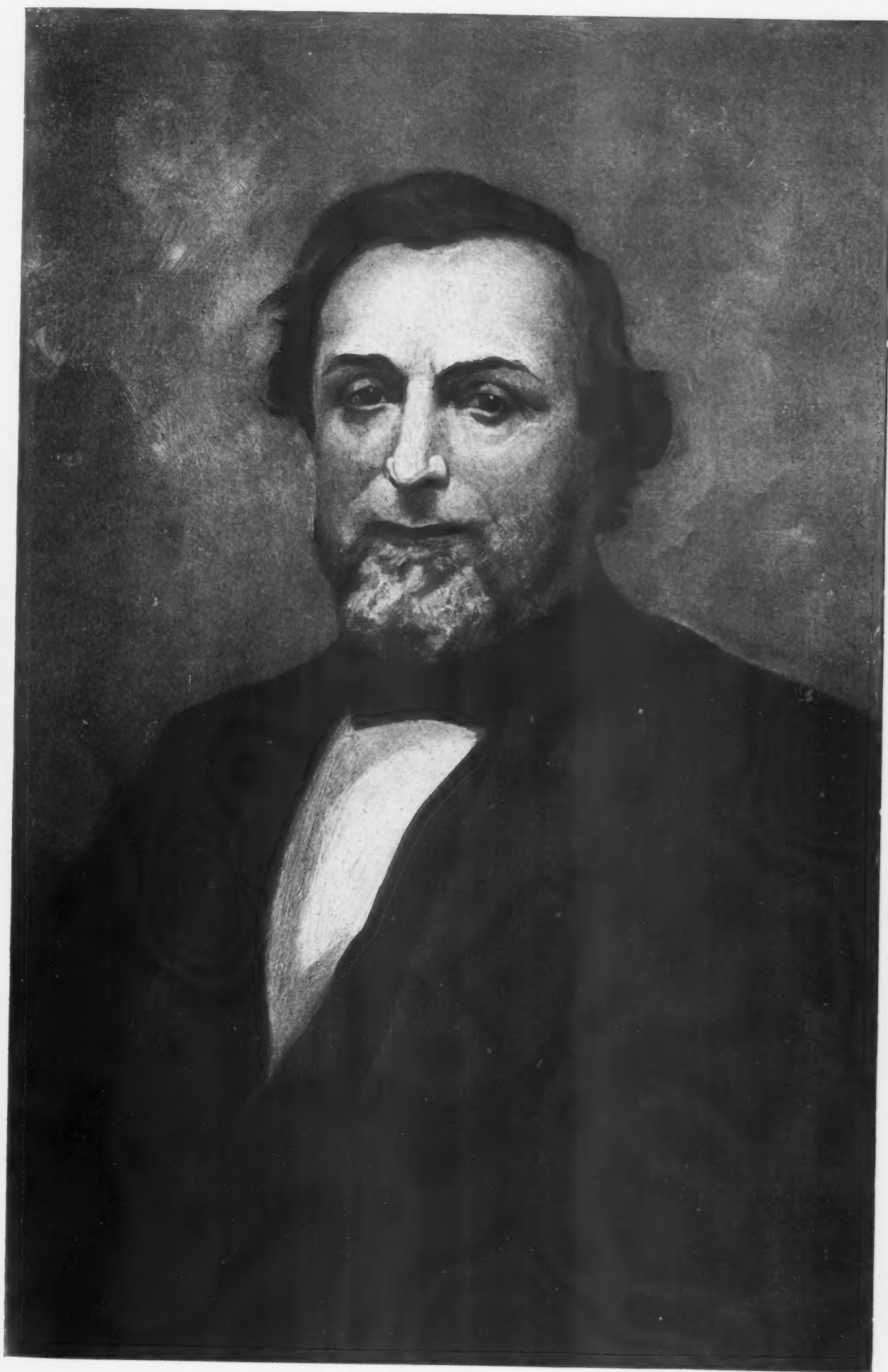
John Williams was in many respects a remarkable man, with a phenomenally active mind, a highly developed imagination and ideas far exceeding the limitations of his opportunities. Men of his temperament care

less for the gains of systematic industry than for the current excitements of diversified mental activities. He was a man of strong convictions. Anything in the way of a reform movement had for him an irresistible attraction. He was a religious enthusiast, but was unalterably opposed to the restraints of a formal church relation, delighting in theological controversy and in ostentatious nonconformity to the dicta of ecclesiastical authority. He was a forcible and impassioned advocate of what he believed in and equally zealous in the condemnation of what he doubted or disapproved. The period between 1845 and the outbreak of the Civil War witnessed the birth of many movements, some ephemeral and others, notably the antislavery movement, in which he took an active part, epoch-making in their influence. Many of these movements, promising reforms of greater or less consequence, powerfully attracted a man of the temperament of John Williams. The temperance cause at that time divided society into two distinct classes and the best elements of every community were opposed to all traffic in liquor. Into this contest Mr. Williams plunged with characteristic enthusiasm, and he did all he could to create a controlling popular sentiment in favor of prohibitory legislation as applied to the sale of intoxicants of all kinds. He was a leader of the movement to incorporate into the statutes of New York the drastic provisions of the Maine law, then attracting great attention. This movement gave promise of success at one time, but seems to have been overshadowed by the more exigent political problem of restricting and finally abolishing the institution of negro slavery. These fascinating but unpractical activities naturally drew Mr. Williams from commercial pursuits into the then open field of personal journalism. He edited for a time a local newspaper in Port Jervis, the *Tri-State Union*, and later founded and conducted a temperance journal with the surprising name of the *Maine Law Precursor*. To have refrained from polemical writing would have for him impossible. His literary style was that of the controversial pamphleteer of the age—virile, vigorous and incisive. He made a distinct impression upon the radical thought of his time.

John Williams' early training as a hardware salesman led him to believe that this business, then in its beginning, offered him a promising career in this country, and he decided to return to it in 1854. His first engagement in this line was as a traveling salesman for the saw manufacturing firm of Wheeler, Madden & Bakewell, Middletown, N. Y. He started out with his customary enthusiasm, but was soon recalled for a reason which many salesmen of the present time would be glad to have interrupt their trips. He had sold so many saws that it would tax the resources of the plant to the breaking point to catch up with his orders in half a year. His employers were quite willing to hitch their chariot to a star, but when it came to hitching it to a comet the pace was too rapid. Those were the days of small things in American manufacturing. No one concern being in a position to afford him full opportunity for his high voltage energy as a salesman he decided to establish himself as a general manufacturers' agent in hardware and to handle a number of lines.

Impressed with the advantages of encouraging in every way the development and diversification of American industry he felt the need of a newspaper which would be in some sense a personal organ and in still larger degree represent the industries in which he was especially interested in their struggle for recognition in the fiscal policy of the Government. Accordingly in connection with his hardware business

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JOHN WILLIAMS.

he devoted himself to the publication of the trade journal, which he began in 1855, under the name of the *Hardware Man's Newspaper*, his son, David Williams, who had learned the printer's trade, having to do with the mechanical part of the business. The father thus assisted was to manage and conduct a hardware agency and edit the newspaper concurrently. Thus what is now *The Iron Age* was begun. It was first published from Middletown, N. Y. The printing was done in Buffalo in the office of Platt, Matthews & Co. It was originally a monthly of four or eight pages, as circumstances required. Although far from attaining the standards of the modern newspaper in any respect it was undoubtedly useful, as it was self-sustaining almost from the beginning. It presented the first opportunity ever offered to those engaged in the manufacture of hardware and in the production of iron to become known to buyers and dealers through the medium of specialized advertising, and it was utilized at once with advantage to all in interest.

This journal appeared under its present name, *The Iron Age*, in April, 1859. The reasons for the change of name are given at great length in the leading editorial of that issue. It would scarcely be of interest to quote this at great length, as it dealt very largely in glittering generalities as to the distinguishing features of the nineteenth century and the predominating importance of iron as a factor of civilization. The concluding paragraph of this editorial, however, is of sufficient interest to warrant its reproduction:

"We call it *The Iron Age* as at once expressive of its design and suggestive of the importance of its mission. In asking for it a generous and widespread support from all who desire the industrial prosperity of America we shall not be prodigal of promises, but shall only state that it is our intention to defend in these columns, faithfully and constantly, the claims of domestic industry, to maintain unswervingly the dignity and the rights of labor, to keep in view prominently the manufacturing capacity of the country, and to apprise our readers timely of everything of importance to the iron trade, whether in this country or Europe. Eschewing all mere party politics we shall express our sentiments fearlessly upon every question affecting the manufacturing welfare of the country, and shall especially labor to demonstrate the necessity and advantage of a settled protective policy."

Looking back over the files of this journal since the foregoing was written it is interesting to note that in no instance has the policy therein outlined been varied from by the breadth of a hair. If written to-day it could scarcely define with more accuracy or in fewer words the editorial and business policy of *The Iron Age*.

Finding Middletown too small a center for his business activities John Williams decided to remove to New York. This removal was effected in 1864, the business locating at No. 80 Beekman street, in an old dwelling house remodeled for business purposes. A very small space contained its counting room, editorial offices and composing room. It had then no presses, but was printed from its own type in one of the large printing establishments near by. In the larger field new interests attracted Mr. Williams. He became connected with an extensive scheme known as the American Emigrant Company, which had secured a tract of over 1,000,000 acres in Iowa and proposed to settle it with what would now be called assisted Swedish emigrants. His interest in this undertaking and in others which grew out of it diverted his attention from his hardware business and to some extent from his newspaper business. He gave up his hardware

agency in 1868, sold *The Iron Age* to his son, David Williams, in the same year, and devoted himself to the interests of the company he had promoted. He died soon after while traveling in the West.

When it passed into the ownership and control of David Williams *The Iron Age* was little more than a promising opportunity. For a young man without capital or newspaper experience, and with little or no acquaintance in the trades it addressed, its assumption was a great undertaking, requiring courage, sound judgment and a concentration of purpose which nothing could divert from the object to which it was directed. In the possession of these qualities David Williams was the antithesis of his versatile father. He studied the problems of his business with tireless industry and decided every question as it arose with reference to the effect of his decision for ten years ahead. His rule in business was that of the great Apostle, "This one thing I do," his sole ambition to make *The Iron Age* a great and successful newspaper by giving it the quality of indispensable utility to the trades which it addresses. It may be said with truth that to his business success the fortuitous accidents of chance contributed very little. After nearly 40 years he remains at the head of the business, but is no longer active as formerly in his attention to detail. Its perfect organization has rendered this unnecessary.

Of *The Iron Age* as a newspaper at various stages of its development the least and perhaps the best that can be said is that it obviously met the requirements of the service it sought to render the trades it represented. As those requirements changed it changed, and to judge it at any period one must know its contemporaneous environment. Its growth has been steady, and while it has felt the alternating influence of prosperity and depression in the productive and distributive industries it has in no year failed to make essential progress. Seasons of extreme depression, attended by what seemed at the moment to be the collapse of business all along the line, frequently contributed considerably to its upbuilding. At such times a journal of exact and uncolored trade information has been most appreciated and the value of a medium of direct communication between manufacturers and consumers most conspicuous. In the existing conditions of more stable business equilibrium it sails on even keel, little influenced for good or evil by the changes of the outlook from year to year.

David Williams.

Of David Williams, the compiler of this historical sketch, who was for nearly a quarter of a century his business associate in intimate and largely confidential relations, avails himself of the opportunity to say what the native modesty of the gentleman referred to would probably prefer to leave unsaid, but without which this retrospect would be essentially incomplete and unsatisfactory:

"The man whose name is probably best known in the iron, steel, hardware and metal trades of the United States, David Williams, is known other than by name to comparatively few, and intimately to still fewer. With every natural and acquired qualification for social intercourse on the highest plane, he has preferred the retirement of his own domestic circle, and even in his business relations has found it agreeable to be represented rather than to represent himself.

"In character and temperament David Williams is peculiarly lovable. In business he is broad-minded, just and liberal. His judgment of men, while accurate, is



DAVID WILLIAMS.

always tempered by kindly consideration. He is patient toward all men, but the only claim upon his confidence and respect is founded in honesty of purpose, unvarying truthfulness, loyalty to principle and fidelity to duty. He has enjoyed life simply, but has never lost sight of the fact that a successful business policy must be planned for as far ahead as a clear foresight can penetrate.

"To know a man through the daily intercourse of a quarter of a century is to know him well. During that long and always delightful association I never heard David Williams speak rudely, discourteously, impatiently or without a delicate consideration for the feelings of the person addressed.

"It gives me pleasure to say that I have never known David Williams to take an unfair advantage of a business opportunity, large or small, nor to treat any one other than he would expect and desire himself to be treated in like circumstances. To command the love and loyalty of those about him, and especially of those associated with him in business or in his employ, involves no effort on his part. The years of my association with him are the pleasantest memories of my life."

J. C. B.

Changes in The Iron Age.

Until 1873 the form in which *The Iron Age* was published was that of a four or eight page newspaper, beginning with dimensions about 11 x 20 inches and increasing from time to time until in 1865 it had become a newspaper about the size of the *New York Sun*. The growth of its business requiring too many pages of this size for convenient printing it was increased in 1871 to a paper with eight wide columns to the page and about the size of the *New York Tribune* at the present time. In this form it was known as a "blanket sheet," sometimes carrying 16 pages to the number and occupying so much room on a desk as to be extremely inconvenient. Indeed, it was not unusual for subscribers to write, when in a jocular mood that if *The Iron Age* got any larger they would have to build new offices in order to have room to open it. In this shape, however, it was a very handsome publication. The mechanical work was always beautiful, the paper of good quality and the printing as good as the facilities then existing permitted. In this blanket sheet form it enjoyed the reputation of being the largest newspaper published in the world.

In the beginning of 1873 the shape of *The Iron Age* was changed to about that of the present form of *Harper's Weekly* and the number of pages increased. It was believed that this change would enable the readers to keep the journal on file and to bind it for permanent reference, as many of them desired to do, but the files were necessarily large and considering the great number of pages it was necessary to carry this plan failed to realize the advantages expected. The final change to the present magazine form was made, and in this form it will probably continue as long as it is published. Most of the trade newspapers of the world are adopting this shape, but it required much courage and great expense on the part of *The Iron Age* to so far depart from newspaper traditions and be a leader of progress in this direction.

More intimate details than we have given respecting the history and development of *The Iron Age* will perhaps have more interest for those identified with it than for the general reader. The fact that at the end of its first half century it stands admittedly at the head of trade journalism in every country, is found in practically every establishment where its special information has interest; that it is well established in the respect and esteem of its readers; that its circulation has in-

creased steadily and rapidly and is still growing; that it carries a greater volume of legitimate business advertising than any other journal published; that it begins its second semicentennial period in the full tide of well-earned prosperity, are facts which would not be made more impressive by elaboration.

John S. King.

Among those associated with David Williams in the upbuilding and development of this business the first place in seniority and importance belongs to John S. King, who, after more than 40 years of continuous connection with it in a responsible and managerial relation, died on the fifth day of March, 1904. To the patrons and customers of *The Iron Age* and its associated publications Mr. King was attached by the ties of old friendship. This is necessarily more true of those who had business with *The Iron Age* in the days of its upbuilding than of more recent friends. That he survived most of the generation of manufacturers and merchants in the iron, steel, metal and hardware trades of the sixth and seventh decades of the last century, when his impressive personality loomed large in the management of the business, made him feel at times as if old things had passed away and all things had become new. But not a few remain of those who for some 40 years have had more or less intimate relations with him in the way of business and to whom his name is as well known as is that of the journal with which he was so long and so usefully connected.

In the selection of those who worked with him Mr. King's judgment was sound and his method of instruction that best calculated to accomplish the purpose in view. Patient with inexperience and tolerant of honest errors of judgment, he had no patience with carelessness and no toleration of sham or pretense. Any tampering with the truth was to him a danger signal and made him suspicious at once. No man had his confidence who did not deserve it; none failed to command it who had established the right to claim it. He enjoyed the respect and affection of all who worked with him or under him.

The data for a complete and satisfactory biographical sketch of John S. King do not exist. Always modest and, as to himself, inclined to be reticent or to undervalue and deprecate as of no consequence that in his intellectual life which would have commanded cordial admiration had he made much of it, the material at command is meager and essentially fragmentary. What he said about himself was usually humorous, but no man took himself more seriously in his work or realized more fully that the duties of life were paramount to its enjoyments. He sought rather to conceal than to invite attention to acquisitions and accomplishments of which ripe scholarship would have had reason to be proud. Diffident and retiring, he often refrained from taking part in conversation which he could have made memorable by luminous exposition drawn from the fund of his accumulated knowledge. His reading and study were for the cultivation of his mind and the gratification of his own taste. He never thought of himself as wise or cultured, but he was both to a degree rarely attained by men devoted to intellectual pursuits. He had a remarkable mind and a capacity for the acquisition of knowledge possessed by but few men whose powers have not been systematically trained. To speak and perhaps think of himself as superficial and a reader rather from curiosity than with the purpose of intellectual development, was characteristic of his temperament. It was true only to the extent that devotion to business gave him but limited opportunity for reading and study.

David Williams and John S. King had been boys together in the printing office of the *Middletown Press*. Their association was interrupted by the enlistment of King for the Civil War. After its close they came together again, and when in 1868 Mr. Williams succeeded his father in the proprietorship of this paper he made Mr. King an offer to come with him in the capacity of general office and business manager, although in the days of the beginning of *The Iron Age* such important titles were scarcely thought of. The association thus begun lasted while Mr. King lived.

As a business man Mr. King was very capable and possessed the ability to grow with a business under his management. His methods were conservatively progressive. Never adventurous and always insisting upon fully understanding the immediate and, as far as they could be predicted, ultimate consequences of every step, he had the courage of his business convictions and a tenacity of purpose not easily discouraged. Very systematic, he never sacrificed to routine or detail the time and talent needed for a study of the larger problems of a business policy planned for the future. Through the years devoted to the upbuilding of the properties of which he was the business executive he was a model of industry, punctuality and devotion to duty. As the field of his work expanded he was able to relegate to others the less important details and reserve for himself the special functions for which his large experience and intimate acquaintance with every detail of the business gave him unique qualifications. What he did was always done quietly and without excitement. One rarely saw him ruffled or disturbed; never was he boisterously hilarious. His temperament was equable, his nerves steady and his temper under perfect control. In everything pertaining to the business of his life he was so thorough that he was rarely surprised and never seriously disturbed.

In his personal character Mr. King was essentially human in the best sense of the term. He never carried amiability to the point of weakness, nor complaisance further than was safe. He was strictly honest in thought, word and deed, to a degree that distinguished him from the average man. Truthfulness was his invariable habit. Able, when it seemed best, to keep his own counsel, he either said nothing or expressed himself in a language which admitted of no misconstruction or misinterpretation and which was meant to be understood literally. In some things he had views of his own which he held with amusing tenacity. The incident of his refusal to permit the amputation of his foot in the military hospital when assured that it was necessary to save his life was entirely characteristic. Against his conviction that the member could be saved in useful form the judgment of the field surgeons counted for nothing. If his obstinacy had cost him his life no doubt he would have died better satisfied to have it so than to have lived a cripple, not quite sure that the sacrifice to which he was asked to consent was necessary. That his judgment was not inerrant goes without saying, but it was his judgment and he felt that it was his safest guide in all the affairs of life.

The following tribute to the memory of John S. King by his friend Mr. Williams has a beauty and pathos which one more practiced with the pen might have failed to impart. The lament of David for Jonathan is not more tenderly expressive of manly grief at a parting which severed ties closer than those of brotherhood:

In Memoriam.

No truer friend than John S. King ever lived, nor a man whose integrity was more absolutely above suspicion. For 47 years, from boyhood

to the threshold of old age, we have walked hand in hand through prosperity and adversity in uninterrupted friendship and mutual confidence. Of almost the same age, we began our business life in the same printing office in 1857, and ever since, except when his service in the Civil War or the temporary absence of either separated us, have passed our days side by side at adjoining desks.

He was able and indefatigable in business, genial and generous in every relation, modest and forgetful of self, true and absolutely just. He never countenanced or even had patience with a mean or questionable act, and was therefore universally regarded as the embodiment of honor and fairness. He will be mourned by hosts of friends and will be long remembered as a man without reproach.

To me his loss makes a void which can never be filled. I am proud to have been thought worthy of a friendship such as is seldom the good fortune of any man.

In admiration of his life and character, in thankful remembrance of what he was to me through nearly my whole life, in grief for the loss of my companion in all the vicissitudes of fortune,

I am, sadly,

DAVID WILLIAMS.

James C. Bayles.

James C. Bayles, M. E., Ph. D., became connected with *The Iron Age* as its editorial writer in 1868, within a few months after its acquisition by David Williams, and about the beginning of 1869 surrendered other connections and became its editor. In this relation he continued uninterruptedly until 1889.

Dr. Bayles resigned the editorship of *The Iron Age* and *The Metal Worker* shortly after his appointment to the presidency of the Board of Health of New York by Mayor Abram S. Hewitt. He was also at this time extensively engaged in manufacturing operations, which closely occupied him for several years thereafter. He is still active in business, but devotes most of his time to consulting engineering work in connection with municipal departments and public utilities. He was a versatile journalist, a brilliant writer and very popular in all professional and social relations. His work in the creative stage of this business was of lasting value, but fitted the conditions then existing better than it would those of the present time. Dr. Bayles has been a contributor of *The Iron Age* during the past ten years, but not in a systematic or habitual way. For a number of years he conducted *The Iron Age* and *The Metal Worker*, so far as their editorial and reading columns were concerned, single handed. This called for a very large and continuous literary output, and as most of the work was done before the days of stenographers and typewriters such conditions the journalist of the present time would be likely to regard as impossible. It used to be said of his manuscript that a page of his copy was the prettiest to look at and the hardest to read of any which reached the composing room. The printers were in the habit of calling it Chinese, but that of course was a pleasantry. Somehow they did manage to read it, although it is remembered that corrections of proofs were a good deal more serious than would be possible under the present conditions of newspaper production.

Dr. Bayles has for some years had an editorial connection with the *New York Times*, where his work is greatly valued.

Strickland K. Marks.

The first special hardware editor of *The Iron Age*, Strickland K. Marks, died May 12, 1883. The service of *The Iron Age* in that capacity covered a period of about

13 years, and his work was of great value in systematizing the trade information and special trade literature of this journal. Mr. Marks was a descendant of one of the best families in Ireland. He learned the hardware business as the apprentice of his uncle, a prominent merchant in Parsonstown, with a thoroughness which young men in this country consider quite unnecessary. There being few promising avenues of usefulness open to young men in his native country he decided to come to the United States and try his fortunes in the New World. Arriving in New York in the year 1858 he found an engagement in the hardware business as a salesman and traveler and soon became well known in the trade. His thorough knowledge of the business in all its branches rendered him peculiarly valuable to such a journal as *The Iron Age*, and in the year 1870 he became a member of our staff as commercial editor and manager of our hardware department. In this position he continued until compelled by sickness to relinquish its duties.

Mr. Marks was well known and highly respected in the iron, hardware and metal trades of the country and possessed peculiar qualifications for reporting the fluctuations of these markets. Thoroughly well informed, absolutely honest, devoted to his work and with the unshaken courage of his convictions, his market reports were everywhere accepted as authority. He was a man of great discretion, clear and incisive judgment and strong practical common sense. His duties were discharged without favor and without prejudice, and when he knew he was right and had satisfactory evidence of the correctness of a statement or quotation no menace or persuasion could induce him to change or modify it.

The Staff of 1906.

The present organization of *The Iron Age* consists almost entirely of men who have been identified with it during the greater part of their business lives. Long periods of service are characteristic of the relations between Mr. Williams and his associates and employees and this extends not only to the editorial and business departments of the different publications, but also to the mechanical department, which was not organized as a separate company, the Williams Printing Company, until 1887.

The present organization of the David Williams Company consists of the following Board of Directors:

David Williams, president.
Charles Kirchhoff, vice-president.
Richard R. Williams, treasurer.
George W. Cope, secretary.
Harry C. Mabie.

Charles Kirchhoff.

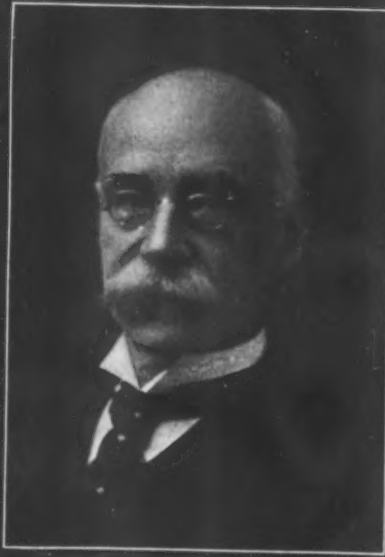
Mr. Kirchhoff became editor of *The Iron Age* in 1889, succeeding James C. Bayles. A native of California, he entered the Royal School of Mines at Clausthal, in the Hartz Mountains, and in 1874 took the degrees of mining engineer and metallurgist, separately conferred in Germany. He became chemist and assayer at the Delaware Lead Works in Philadelphia in the same year. The Centennial Exposition in 1876, during which the partial idleness of the plant with which he was connected gave him considerable leisure, was the occasion of his first ventures in journalism. He was encouraged and guided in them by his father, who had been for some years, and was to the time of his death in 1890, an editorial writer and the metal reporter of *The Iron Age*. Mr. Kirchhoff wrote a series of letters descriptive of the mineral re-

sources of different countries as revealed by their exhibits and of the mining, metallurgical and general machinery for a Cape Town and for a Melbourne paper. These attracted the attention of the editor of the London *Mining Journal*, and led to his appointment as the American correspondent of that journal, a relation which continued for a number of years. After the close of the Centennial Exposition Mr. Kirchhoff devoted a large part of his leisure to preparing documents and correspondence in foreign languages and abstracts of foreign technical literature on tunneling for Henry S. Drinker of Philadelphia, who was then writing his monumental treatise on that subject, and who has only recently returned to his first profession as engineer by accepting the post of president of Lehigh University.

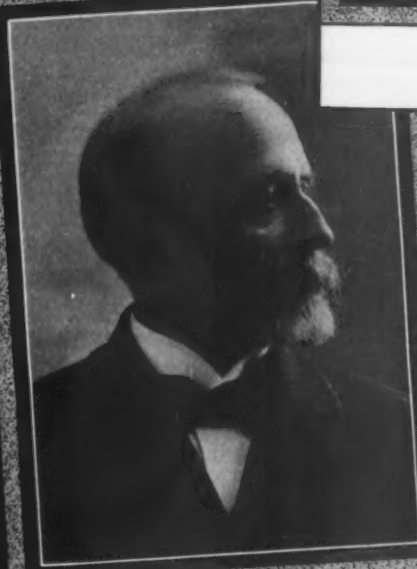
In 1877 David Williams started the *Metallurgical Review*, the first engineering magazine published in the English language and the forerunner of the admirable publications of that class of the present day. After a few numbers had been issued James C. Bayles, the editor, finding his energies taxed by the conduct of *The Iron Age* and *The Metal Worker* appointed Mr. Kirchhoff as his assistant. A year's experience proved that a strictly technical monthly magazine, occupying a comparatively narrow field, could not then secure the necessary support, particularly in the matter of contributions. The *Metallurgical Review* was therefore merged with *The Iron Age* and Mr. Kirchhoff was transferred to the staff of the latter journal as assistant editor, with the duty of watching and recording technical progress. During that time he became more and more interested in the commercial side of the editorial work. In 1881 he accepted the post of managing editor of the *Engineering and Mining Journal*, and in that capacity developed the statistics of the production of the United States of copper, lead and zinc, amplifying the work of Heyne and Caswell, the pioneers in that field. Upon the establishment of the division of Mineral Statistics of the United States Geological Survey Mr. Kirchhoff was placed in charge of the work so far as it related to the metals named and has written the reports since that time. In 1884 he returned to *The Iron Age* as associate editor, and in 1889 became editor-in-chief. He was elected vice-president of the David Williams Company upon the formation of that corporation, and upon the death of John S. King took charge of the entire interests of the company as general manager.

Richard R. Williams.

Soon after the removal of *The Iron Age* to New York City its reports of the iron and hardware market were written by Richard R. Williams, brother of David Williams. He had acquired some familiarity with the business in the employ of Russell & Erwin Mfg. Company, 87 and 89 Beekman street. This connection with the journal was interrupted by his professional career as a clergyman, until on the partial failure of his health he was obliged to discontinue his chosen work, and in 1883 again accepted a place on the staff of *The Iron Age*, of which he became the hardware editor, a position which he still occupies. During this period the field of the paper in hardware as in other departments was greatly broadened, and in connection with the reports of the markets, which had always been a prominent feature of the journal, many subjects relating to the trade have been discussed and treated with some fullness with a view to furnishing information serviceable to hardware merchants and manufacturers. Among these may be mentioned hardware store arrangement, approved methods of



GEORGE W. COPE



RICHARD R. WILLIAMS



C. KIRCHHOFF



ALVIN I. FINDLEY

conducting business, systems for ascertaining and recording manufacturing costs, factory management and the many questions which from time to time presented themselves in connection with hardware interests. Several volumes relating to these subjects have also been compiled and published. The organization of hardware associations, both State and national, has been fostered by *The Iron Age*. The hardware editor is a familiar figure at their conventions, and his voice is frequently heard in the discussion of the graver questions of trade policy and in a lighter vein as an after dinner speaker. In the conduct of the Hardware Department Mr. Williams is assisted by the following efficient staff: A. J. Barnett, F. E. Thompson, E. H. Darville and A. H. Chamberlain.

George W. Cope.

Mr. Cope's connection with the iron trade dates from April, 1873, when he entered the service of the American Iron and Steel Association, Philadelphia. James M. Swank had taken charge of the affairs of the association in January of that year, and Mr. Cope's connection thus began at the time when the foundations were being laid for the statistical work of that organization, which has won world wide recognition for its accuracy and thoroughness. It was found necessary to make personal appeals to iron and steel manufacturers for the figures of their production during the first few years of this work, and Mr. Cope traveled extensively through the iron producing section of the country for that purpose, successfully gaining the confidence of manufacturers in the disinterested work of the association and incidentally acquiring a knowledge of the various branches of the iron trade and an acquaintance with its leading members, which proved highly valuable in the functions which he afterward filled. While connected with the American Iron and Steel Association he became an editorial contributor to *The Iron Age*. After several years' connection in this capacity he was regularly engaged on the paper in August, 1883, as associate editor. In May, 1885, he was elected secretary of the American Iron and Steel Association, Mr. Swank having been made general manager of that organization. He served in this capacity until the close of 1886, when he resigned to take the position of Western associate editor of *The Iron Age*, with headquarters at Chicago. The creation of this position was a new departure by *The Iron Age*, but it was undertaken for the purpose of bringing the paper more closely in touch with the spirit of the progressive and aggressively enterprising West, as typified in the manufacturing and commercial interests clustered in and about Chicago. Undertaken as an experiment, Mr. Cope's labors in the West were maintained until May, 1902, when it was decided that his services were more imperatively needed in the home office, and he was transferred to New York. He is now the managing editor.

Alvin I. Findley.

Mr. Findley, who became one of the editors of *The Iron Age* in June of the current year, has had a wide journalistic experience and has been identified for a number of years with the iron and allied industries of the central West. Following his graduation from college in literary and scientific courses, Mr. Findley was engaged for 10 years in various lines of newspaper work as correspondent and editor in Akron, Ohio, Chicago, Philadelphia and Cleveland. In 1892 he became editor of the *Iron Trade Review* at Cleveland and vice-president of the Iron Trade Review Company, continuing in editorial charge of that journal until June 1, 1905.

Writers and Editorial Assistants.

The Centennial Exhibition of 1876 proved an opportunity for a display of enterprise on the part of the editorial management of *The Iron Age*. Several experts were stationed in Philadelphia, who paid particular attention to the machinery exhibits, which proved such a revelation not only to foreign visitors, but also caused our own country to realize how rapid had been the progress of American mechanics toward the substitution of special machinery for hand labor. It led to a permanent strengthening of the staff in that direction, and the mechanical editor became one of its important members. The post was filled in succession by W. E. Partridge, Albert Spies, S. D. V. Burr and the present incumbent, H. R. Cobleigh, who has been connected with *The Iron Age* since the early part of 1904. A graduate of Sibley College, Cornell University, he was connected in turn with the Western Electrical Company and James Beggs & Co. He then joined the editorial staff of the *Engineering Record*, and subsequently became publicity writer for the Crocker Wheeler Company.

For years the industrial news has been a feature of *The Iron Age*, the members of the staff who are in charge being George Powell and Percy A. Ware.

John Nelson, New England editor, was educated at the Worcester Polytechnic Institute, Worcester, Mass. He received his early journalistic training as a reporter for the Worcester *Evening Gazette* and later was city editor of that paper for several years. In 1898 he went to the Worcester *Telegram*, specializing on industrial, business and banking news. His first association with *The Iron Age* was as the author of occasional news letters covering Worcester and vicinity. On April 1, 1903, he was given charge of the editorial work in New England.

At a very early date the editorial management of *The Iron Age* arranged for special correspondence from Washington. For years George De B. Keim, a well-known journalist, sent regular letters covering the news in the different departments of interest to the metal industries. Upon Mr. Keim's retirement W. L. Crounse took charge of the work, which has greatly expanded in his hands.

A special correspondent, who has served *The Iron Age* for many years is Dwight E. Woodbridge, who is stationed at Duluth. Thoroughly familiar with the older ranges Mr. Woodbridge has watched the developments on the Vermilion and Mesaba ranges from the days when the first ton of iron ore was shipped from them. No one possesses information so full and so accurate of the facts bearing upon the iron ore industry of Lake Superior in all its bearings.

Harry C. Mable.

Harry C. Mable, the manager of the advertising department of the publications of the David Williams Company, began his career as a boy in the office 25 years ago, in October, 1880. He answered an advertisement in one of the New York papers for a boy in a publishing office, as a result of which he began his business career in the office of David Williams, publisher of *The Iron Age*. Besides John S. King, the business manager, the staff in the business department included seven people and one boy besides himself. Advertising matters were cared for by S. K. Marks, in connection with other duties of an editorial nature, assisted by D. M. Richards. There were two subscription clerks, a bookkeeper and a clerk who combined the duties of collecting city bills and filling orders for books.

In the fall of 1881 Mr. Mable was assigned to assist

in work on the subscription list, and in 1882 to assist S. K. Marks in the place of D. M. Richards, whose health necessitated a long leave of absence. When Mr. Richards returned he was retained in the advertising department owing to the illness of Mr. Marks, which finally resulted in his death in 1883, the first and only death during his connection with the business until that of J. S. King in March, 1904. Under the instruction of Mr. Marks many of what had been the mysteries of the advertising department were explained, and Mr. Mable found the work of increasing interest. Shortly after Mr. Marks' death D. M. Richards was, because of his health, compelled to resign, and Mr. Mable was permanently assigned to care for matters in connection with the advertising department under the direction of John S. King, the business manager. This brought him into occasional contact with Mr. Williams and into more frequent contact with Mr. King, and to their approval and appreciation his success is due.

During the past 15 years Mr. Mable has enjoyed the advantages of close association with the management and of winning respect and confidence. Although still a young man he is an important factor in the business and has the satisfaction of knowing that what he has gained was earned by faithful and intelligent service.

The two most important steps to meet the changing conditions, and which were destined to have a marked influence on the future success and growth of *The Iron Age*, were the establishment of additional branch offices in leading centers in charge of representatives giving their entire time to the interests of *The Iron Age* and other publications issued by David Williams and the change in shape and size of the paper in 1888 from a sheet of about the size of a daily to its present magazine size. In 1886, on the organization of the Williams Printing Company, John S. King was made its treasurer and general manager. His time was, therefore, very largely taken up with the details of that organization, and a larger share of matters in connection with the advertising department was left to Mr. Mable. The demand made on Mr. King's time by the business of the Williams Printing Company rapidly increased to such an extent that he was compelled to gradually relinquish all matters of detail in connection with the advertising department, the management of which was assumed by Mr. Mable about 1896, and in 1904 he was elected a director of the company.

Mr. Mable's principal assistants in the advertising department are Richard F. Williams and C. S. Bauer, who have been identified with the work for a number of years.

A veteran of the business staff of *The Iron Age* is the cashier,

George J. King.

With the increase of his routine duties to a point demanding their subdivision John S. King sent for his brother George, then in business in Middletown, N. Y. He came January 1, 1879. He had been a bookkeeper and accountant in a local foundry but entered as subscription clerk. In 1880 he took general charge of the books, and in 1887 he became cashier and has filled that position continuously ever since.

The Accounting Department is in charge of

Edwin N. Chapman

who was graduated from Williams College in 1894. He entered the employ of the Butler Hard Rubber Company. Shortly after the combination of that company with others into the American Hard Rubber Company in 1899 he left in order to start a rubber factory, which later was also absorbed by the American Hard Rubber Com-

pany. He then entered the field of expert accountancy, first with Patterson, Teele & Dennis and afterward with Haskins & Sells, receiving the degree of C. P. A. from the University of the State of New York while with the former firm. In 1902 he was appointed auditor of the Westcott Express Company, resigning from that position to become auditor of the David Williams Company in July, 1903.

Joseph L. Stearns.

The oldest living member of the staff of *The Iron Age* is Joseph L. Stearns, who came to it as foreman of the printing office in August, 1856, and brought out the first issue of the paper bearing the name of *The Iron Age*. Since that time his service in this important capacity has been continuous and owing to general good health and regular habits he has missed very few days out of all this long time of years.

When Mr. Stearns came with the paper the printing office was very small. It had probably half a dozen fonts of type, one imposing stone and a few necessary tools. Two compositors and an occasional extra man on publication days did all the typesetting. In these early days Mr. Stearns had his own troubles with the editorial room in maintaining a supply of copy which permitted the work to go on smoothly and without loss of time. John Williams, while capable at times of astonishing industry, was very apt to leave the greater part of his week's work until the last minute.

Mr. Stearns has continued in this important relation with the newspaper ever since. He is now 65 years of age, but is still in personal charge of the make-up of *The Iron Age* and other publications.

The only other survivor of the original force of the printing office of *The Iron Age* is Matthew Healy, who came with it during the management of John Williams as compositor. Mr. Healy has never since worked in any other office, is now an invalid living in Connecticut, but he remains upon the payroll. Another veteran, Frank Armande, retired from active work some three or four years ago, after a continuous service of about 25 years. *The Iron Age* has always been a favorite office with printers. To obtain permanent employment in it has been the ambition of every one who has had connection with it. The policy of the management has always been liberal, and a strike has never occurred. Of such a record any employer may be proud.

The Branch Offices of The Iron Age.

A feature of the extension of the business of *The Iron Age* has been the establishment and maintenance of branch offices in the principal centers of trade throughout the country. Each of these offices has been successful in proportion to the importance of its field, and each has been managed with sound judgment and entire loyalty to the interests of the business.

Philadelphia.

The first of the branch offices to be evolved from the original plan of local representation was that of Philadelphia. In the selection of a representative for that important point natural fitness was deemed of more value than experience. The choice of Philadelphia representative fell upon

Thomas Hobson.

Referring to his first interview with Mr. David Williams, Mr. Hobson says:

"Along in September, 1875, I answered an advertisement in one of the daily papers, in which it was stated that a position was open to represent a New York publication. No reply was made to this application for sev-

eral weeks, however, and during the period intervening I had made arrangements to continue in another business. It was with some surprise therefore that I received a letter asking me to call at the Continental Hotel at a certain hour, and it was with a feeling of curiosity that I responded to the request. At the hotel I found awaiting me two gentlemen—Mr. David Williams and Mr. S. K. Marks—one the publisher of *The Iron Age*, the other closely associated with the business. After a few preliminaries I was told what was required, to which I replied that I had no fitness for such a position and would therefore beg to withdraw my application. Mr. Williams thought differently, however, and suggested that I should consider a proposition from them or make one for myself. Being strongly impressed with the conviction that the position would be unsuitable for me I again asked to be excused on the grounds that I had virtually engaged in another position; that I could not accept any such salary as they would be likely to offer to one who had no experience in the business; that I could earn a large salary in the business with which I was perfectly familiar, and that Mr. Williams could get a man to start where I should have to start at one-half of what I could earn elsewhere, with no better chance of success than a cheaper man would have, both having to take hold of an entirely new business. To this the reply was that *The Iron Age* could not afford to employ a cheap man, and in a case of a willingness to accept the position the remuneration would be made equivalent to what could be earned in any other business. Finally an arrangement was made, which continued with the most complete satisfaction to all concerned until May of the present year, at which time I retired from the active management of the Philadelphia office, continuing, however, the editorial duties as heretofore."

Mr. Hobson was brought up to the provision trade in England, and when about 22 years of age he decided to emigrate to Canada, arriving in Montreal in July, 1860. His first effort was to find employment, and in three days he was duly installed in his old line of business. He well remembers how persistently he had to work to get his first position in that country. This employment continued eight months, when he obtained a position as salesman in a large wholesale house. In 1864 the treaty of reciprocity with the United States was abrogated. This restored a duty of 4 cents per pound on Canadian butter and other dairy products entering the United States and was looked upon with dismay by the house, as it threatened to destroy their trade. Mr. Hobson, however, took an entirely different view of the situation, and said that it was a great opportunity for finding better markets in Great Britain. After some persuasion he obtained permission from the firm to visit the old country to see what could be done. Previous to that date Canadian butter and cheese were hardly known in any of the English markets, but the work done by Mr. Hobson attracted immediate business, the first order being from a Manchester house for 5000 firkins (500,000 pounds) of butter, quickly followed by other and similarly large orders. This trade, of which Mr. Hobson was undoubtedly the pioneer, now amounts to nearly \$50,000,000 per annum, and has placed Canada in the first rank as a producer and exporter of the finest qualities of cheese and butter.

Mr. Hobson's Reminiscences.

Previous to the time above referred to (December, 1875) Mr. Williams had rented and furnished an office at 220 South Fourth street, and when he came to install his new employee the question was asked: "Well, Mr.

Williams, what do you want me to do?" To which he replied with a smile: "I do not know. If I was going to remain with you I could probably tell you, but as I am not I take you to be a man of intelligence and shall leave that to you." This led to a train of thought something on this line: What does the paper require? To which the natural suggestion was, it requires news, a clientage of readers and advertisements. Reading matter must be absolutely in accordance with facts, and, as far as possible, it should be adapted to the requirements of the readers. Subscriptions should be gathered among those likely to be interested in the trades represented in the publications, and advertisements should be secured from those who had anything suitable for the trades represented. The first thing that should be done, therefore, was to call on the trade with these various objects in view—to gather information which would be of value to the trade, to secure subscriptions from all who ought to be on the list and to secure advertisements from those who would be likely to receive good returns.

The policy proved to be eminently successful, the editorial end at all times being maintained at the highest point of efficiency, and as regards the advertising space no better proof of its value can be given than the fact that practically all those who commenced advertising during the period under review remain to this day, and in most cases with largely increased space. In gathering material for reports of the markets difficulties were met with which are not met with in these latter days, although even that may depend upon the personality of those in search of information. Some had the idea that it would be a fine thing to "boost" the market and were therefore inclined to exaggerate their sales; also the prices realized. Others were inclined to give no information on the ground that they could not afford to give away their private business. It was soon found, however, that *The Iron Age* was regarded as an authority, and it was not many months before its representative was received with special courtesy and interchanges of opinions were made with the utmost freedom, it having been made an absolute rule that whatever information was given was to be impersonal and to be used only as it might impart correct color and tone to the general report.

In the course of these many years the heads of all the leading concerns have passed away, but it is a pleasure to call to mind the kindly consideration shown in those early days. Among the well remembered names may be mentioned E. Y. Townsend of the Cambria Steel Company, S. M. Felton of the Pennsylvania Steel Company, Percival Roberts of the Pencoyd Iron Company, Thomas Wood of the Alan Wood Company, David Wood of J. Wood & Bros., J. O. Hughes of Hughes & Patterson, Jas. Rowland of J. Rowland & Co., Stephen Robbins (who owned the only blast furnace ever built in Philadelphia), John P. Veree and Colonel Bringham of the Philadelphia Iron & Steel Company, Robert Cabeen and Adam Konigsmaker of Cabeen & Co., W. R. Hart of Naylor & Co., C. A. Lyman of the Thomas Iron Company; also Edward J. Etting, Edward Samuel & Co. and Peter Wright & Sons were at one time large importers of Scotch and other foreign iron. Only C. C. Knight of C. C. Knight & Bro. and Horace T. Potts remain to represent the original merchant iron trade. W. F. Potts, C. W. Potts and Andrew Wheeler, leaders in the trade, have all passed away, leaving the business to their sons and other younger men.

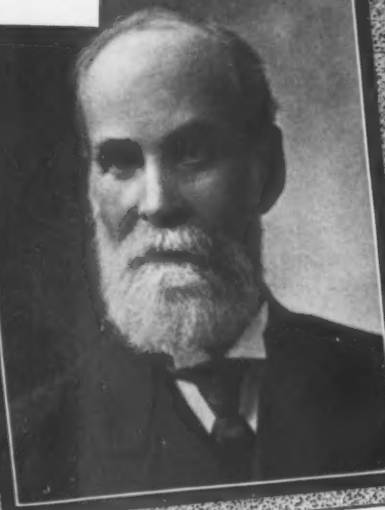
Of the seven rolling mills that were in Philadelphia in 1875 only two remain—viz., Hughes & Patterson and Gaulbert, Caskey & Co. The mills of Jas. Rowland &



HARRY C. MABIE



WALTER C. ENGLISH



THOMAS HOBSON



ROBERT A. WALKER



HENRY SMITH

Co., Philadelphia Iron & Steel Company, Stephen Robbins & Son, Marshall Bros. & Co., and E. S. Buckley, concerns of considerable importance at that time, are now all dismantled and nothing of them left except a memory; and of the two mills still in operation, W. Gaulbert is the only individual member of any of the firms who is now living.

The Enterprise Mfg. Company, which commenced business in a very small way in the late sixties, had in 1875 become a concern of some importance, employing something over 100 hands. The business has grown to very large proportions since then, and with nearly 1000 hands turn out twelve to fifteen times the amount of goods produced in 1875. C. A. Asbury, who at that time and for many years subsequent to that date was the active head of the concern, is the president. Mr. Baker, the mechanical genius and inventor of many of their special tools and appliances, died several years ago.

Among the prominent hardware manufacturers 30 years ago were Henry Disston and George and Henry Barnett, and just coming into notice was the now well-known firm of McCaffrey & Bro., all of whom have passed away except the McCaffreys, who are still in vigorous middle life. The firm of Carr, Crawley & Devlin was also an important firm at that time, but for many years the business has been conducted under the firm name of Thos. Devlin & Co. and has become one of the leading concerns in its line in the United States, under the management of the hale and hearty Thomas Devlin.

A few years previous to this time (1875) Yerkes & Plumb had commenced business as manufacturers of edge tools and had made some progress, and it has since become one of the foremost concerns in the country. The Miller Lock Company, which is now an important factor in the lock trade, was also quite a small concern at that time, but under the management of Milton Jackson has attained a world wide reputation.

Among the hardware jobbers at that time, but who are deceased and the business wound up, were A. Heaton and Reuben and Paul Denckla, trading as Heaton & Denckla; John G. Brenner, Buehler, Bonbright & Co., and probably one or two others. The firm of James Vance & Co. some 20 years ago lost by death Jas. M. Vance, its president, and within the past year his successor, W. C. Peters, also passed away; the business continues, however, under the old firm name of Jas. M. Vance & Co. Chas. M. Ghrisky, one of the oldest jobbers in the city, also died during 1904, after nearly 60 years of business activity. The name of Shannon is one of the oldest in the trade (originally J. B. Shannon on Market street), the business at the present time being continued by J. B. Shannon's Sons of Chestnut Street, another son, J. J. Shannon, carrying on a large business at Seventeenth and Market streets. This retrospect might include others less prominent, perhaps, but in their day well known and of considerable importance in their various lines.

The firms of Lloyd, Supplee & Walton (now the Supplee Hardware Company), the Biddle Hardware Company and E. K. Tryon, Jr., & Co. may be named as conspicuous examples of continuity and progress, standing as they do in the very front rank of hardware jobbers in the United States. Shields & Bro. and Jas. M. Vance & Co. are the oldest houses in the trade, the latter dating back more than a century and a quarter, and are as strong and vigorous as they ever were.

The tin plate and metal trade lost one of its most prominent members by the decease of Clark Merchant, who died about a year ago. Thus it happens that with the exception of the old houses of N. & G. Taylor Com-

pany, Merchant & Co. and Hall & Carpenter the tin plate and metal trade is largely in the hands of those who were in subordinate positions 30 years ago. Prominent among these may be mentioned Gummey, McFarland & Co. and Murphy & Mercer Company. One of the most conspicuous examples of progress during the period under review is that of the Berger Brothers Company, manufacturer of tanners' supplies. In 1875 it began business in a very small way, but by careful attention to details and strictly honorable methods it has built up a business which is second to none in its high character as well as in its extent.

S. S. Reckefus.

The Philadelphia manager of the David Williams Company is S. S. Reckefus. His father was senior member of the firm of S. S. Scattergood & Co., of Philadelphia, one of the oldest importing firms in that city. Joining the organization in 1887 he was admitted to the firm in 1890 and continued a member until the firm retired from business in 1894. It was then that he entered the field with which he has been identified since, remaining with the Remington Bros. advertising agency of New York. In succession he became the Philadelphia representative of the *Electrical World*, was in a similar capacity after that journal had changed hands with the *Engineering and Mining Journal* and with the Maben Advertising Company of Chicago. He accepted the management of the Chicago office of the *Manufacturers' Record* of Baltimore and represented it for about a year, then the *Plumbers' Trade Journal*.

Mr. Reckefus has as his principal assistant A. A. Miller, who has been connected with the Philadelphia office for a number of years.

Pittsburgh.

It was realized at an early date that the events in some of the principal industrial centers could not be effectively watched and recorded by nonresident editors. The plan of establishing editorial offices in other cities was a novel one in trade journalism, the first fruit of it being the appointment as associate editor of Jos. D. Weeks at Pittsburgh. Mr. Weeks had been in close touch with the rapidly developing iron interests of that district, and was actively identified with many of the movements. It was he who first inaugurated the system of reporting monthly estimates of active blast furnace capacity, the forerunner of the present highly developed statistics of *The Iron Age*. He was deeply interested in the labor struggles in the Western iron industry, which year after year convulsed the industry.

The Pittsburgh branch office of *The Iron Age* was established in 1875 under the management of the late Joseph D. Weeks.

Robert A. Walker.

Its present manager, Robert Walker, entered the employ of Mr. Weeks as general assistant on March 6, 1876. In some pleasant personal reminiscences Mr. Walker says:

"Our Pittsburgh office was then located in 14 Fifth avenue on the third floor of a building, the two first floors of which were used by J. Hannich & Bros. The flights of stairs were long and steep and I distinctly remember how many hods of coal I had at various times to carry up from the vault in the cellar. The position of office assistant in those days was strenuous. I continued with Mr. Weeks for two or three years and then left him to enter Curry University of Pittsburgh to supplement the education I had gained in the public schools of my native

city. After two years in the university I joined my father in business in Allegheny. In October, 1885, Mr. Weeks again sent for me. He then had a vacancy in the position of chief clerk. Finding the inducements attractive I returned to him and so continued until he resigned from *The Iron Age* to become once more editor of the *American Manufacturer and Iron World*. This left the office without a titular head and somewhat disorganized, as Mr. Weeks was a man of great versatility, with a very large personal acquaintance. Mr. Williams came to Pittsburgh to see about his interests there, and I remember with great pleasure my interview with him in the Monongahela House, in which the question of appointing me to succeed Mr. Weeks was considered. As I was but 22 years old at the time it is not to be wondered at that he was doubtful if I was old enough to assume such responsibilities. However, he invited me to New York to continue the conference and there I received the appointment as manager of the Pittsburgh office, effective from April 1, 1886. I find satisfaction in recalling that the first telephone installed in public service in Pittsburgh was in my office, then at 77 Fourth avenue."

During his 30 years connection with *The Iron Age* Mr. Walker has seen many great changes in the field with which his identification has been so prominent and so successful. In March, 1876, there were in the Pittsburgh district only four or five blast furnaces, these being owned by Spang, Chalfant & Co., who had two Isabella stacks; Graff, Bennett & Co., who owned the Clinton, Lucy No. 1 of the Lucy Furnace Company; the Eliza Furnace of Jones & Laughlin on the South Side, and one other smaller stack in Lower Allegheny. None of these furnaces made over 150 tons of iron a day, which was a remarkable output for a blast furnace at that time. The principal manufacturers of steel in the Pittsburgh district in 1876 were Hussey, Wells & Co., afterward Howe, Brown & Co., Limited, whose plant was absorbed by the Crucible Steel Company; Anderson & Woods, who went out of business many years ago; the La Belle Steel Works; Smith, Sutton & Co., and the rail mill of the Edgar Thomson Steel Company, Limited, at Bessemer, Pa., afterward owned by the Carnegie Steel Company and which in 1876 made 400 to 500 tons of rails a day. A leading firm was Jones & Laughlin, but at that time the product of this concern was mostly iron and it had only one blast furnace. There was also the old firm of Moorehead & Co., which operated the Soho Iron Works as well as the Soho blast furnace, which was originally built in 1872 and afterward remodeled in 1888. The Moorehead, McCleane Company became financially embarrassed and ceased business, its plant being gradually dismantled, and all that remains of it to-day is the Soho furnace, now owned by Jones & Laughlin Steel Company, by whom it has since been rebuilt. Pittsburgh was practically in its infancy in the iron business in 1876, but along in 1880, or just after the panic of 1879, it commenced to grow at a marvelous rate and its industries expanded very rapidly. In January, 1880, "A" furnace of the present Edgar Thomson group was blown in, "B" followed in April and "C" in November of the same year, these three furnaces having been built by the Edgar Thomson Steel Company, Limited, to make pig iron for the Edgar Thomson rail mill. In 1882 two more stacks were added, these being "D" and "E," in 1886 "F" was added and "G" in 1887. In 1890 "H" and "I" stacks were built and "J" and "K" were added in 1902-1903. Of the 11 stacks now comprising the Edgar Thomson group, four were built by the Edgar Thomson Steel Company, Limited; five by Carnegie Brothers & Co. and two by the Carnegie Steel Company. The first

blast furnace owned by Jones & Laughlin was built in 1888 and ten years later No. 2 Eliza was built; Nos. 3 and 4 in 1900 and No. 5 in 1903. In the Upper and Lower Union mills of the Carnegie Steel Company, in the American Iron Works of Jones & Laughlin and in practically all the mills in the Pittsburgh district puddled iron was the principal product. To-day there are only three or four mills in the Pittsburgh district that have any puddling furnaces. The Carnegie Steel Company, Jones & Laughlin Steel Company and many other large concerns that might be named have not made a pound of puddled iron for years.

Another industry that was important in Pittsburgh some years ago was the manufacture of cut nails, there being no less than six large concerns which made that product, but gradually dropped their manufacture with the advent of the wire nail. In 1878-1879 the Pittsburgh Wire Nail Association was formed, the concerns composing it being Jones & Laughlin, Chess, Smythe & Co., Shoenberger & Co., Lewis, Dalzell & Co., Graff, Bennett & Co. and Spang, Chalfant & Co. The meetings of this association were attended by B. F. Jones, Richard Smythe, John W. Chalfant, James I. Bennett, James C. Lewis and John K. Shoenberger, all of whom are dead, but their mills, with the exception of one, still survive and are prosperous.

In Mr. Walker's period of service with *The Iron Age* the pig iron output in the Pittsburgh district has expanded from an insignificant tonnage in 1876 to a production of 4,383,169 gross tons in 1904, or nearly 30 per cent. of the entire output of the whole country and nearly 3,000,000 tons more than was made by the United States in 1876. In the manufacture of steel, such as rails, billets and sheet bars, Pittsburgh has a wonderful record, having made in 1904 5,261,380 tons of steel of all kinds. The Monongahela Valley on both sides of the Monongahela River for a distance of 30 miles from Pittsburgh is lined with manufacturing plants of all kinds where 20 years ago not one was found. Most of the development of this industrial valley has been in the last ten or 15 years, the Homestead Steel Works and Duquesne Steel Works of the Carnegie Steel Company, the Duquesne blast furnaces of the same concern, the large rod and wire mills of the Pittsburgh Steel Company and the Clairton open hearth works and blast furnaces, now a department of the Carnegie Steel Company, having been built in the last ten years, although the Homestead Steel Works was originally founded by the Pittsburgh Bessemer Steel Company in 1880-1881, but was rebuilt and enlarged by Carnegie, Phipps & Co. in 1892. The Homestead Works was originally built as a rail mill; its first rail was rolled in 1881, the initial capacity being about 400 tons a day. When it is stated that the Homestead Works has a capacity at this time for turning out about 2,000,000 tons of steel a year some idea can be had of the growth of this plant. One could go on indefinitely and tell of the building of other works in the Pittsburgh district, but the statistics are summarized in the single fact that Pittsburgh makes to-day about 40 per cent. of all the pig iron made in this country and 65 to 75 per cent. of all the steel in crude forms, without speaking of finished material.

The natural resources of the Pittsburgh district for cheap manufacturing have of course been mainly responsible for its industrial growth. It has at its doors the Connellsville coal fields, which produce the finest coke in the world, and a haul of only 140 miles on the millions of tons of ore that are used in its blast furnaces every year. It also has its great coal fields up the Monongahela River, affording cheap fuel for manufacturing pur-

poses and in unlimited quantities. Pittsburgh is probably the most important railroad center in the world, its in and out bound tonnage last year having been over 90,000,000 tons.

In the manufacture of heavy rolling mill machinery Pittsburgh stands at the head of all other cities, but does not make to any extent the finer grades of iron and wood working tools. Among the firms engaged in the manufacture of heavy rolling mill machinery may be mentioned the Seaman-Sleeth Company, one of the oldest concerns in Pittsburgh; the A. Garrison Foundry Company, originally established by Abraham Garrison more than 70 years ago; the Mesta Machine Company, which started with a small works at Leechburg and now has one of the largest plants of its kind in the world, located at West Homestead. There are also the United Engineering & Foundry Company, the largest concern of its kind in the country devoted to manufacture of rolling mill equipment; the George A. Hogg Iron & Steel Foundry Company, the Lewis Foundry & Machine Company and others.

Pittsburgh is also prominent in the hardware trade, the leading house being the Bindley Hardware Company, established many years ago by England & Bindley in a small storeroom on Liberty street, but which now occupies an entire block in the central part of the city and which also has built a very large warehouse and manufactures as well. There may be mentioned also the Logan-Gregg Hardware Company, Wolff, Lane & Co., the Joseph Woodwell Company, the latter being one of the oldest hardware concerns in the country. Pittsburgh by reason of its many resources seems destined long to continue the steel center of the world and its development in the years to come is certain to be rapid and continuous.

Cincinnati.

The long established branch office of *The Iron Age* in Cincinnati is still under the management of the gentleman who first opened it, Henry Smith. As he is one of the veterans of our business organization, some personal reminiscences of his connection with the publications of this office will be of interest to his many friends.

Henry Smith.

Mr. Smith's connection with *The Iron Age* began in February, 1872. Its office was then in No. 80 Beekman street. Not satisfied with his employment in the store of a book dealer of Fulton street, he applied at the office for "a job," and his first interview with Mr. Williams was in some sense characteristic of their entire business relation. He was asked to give a specimen of his handwriting. As the day was very cold and he had been employed in carrying a heavy bundle of books which had made his muscles tremulous, his penmanship was pretty bad. Possibly nervousness had something to do with it. He was told that a lad who wrote such a hand as that could not possibly be employed in any clerical capacity, and he was too big to be an office boy. However, as he had made a favorable impression and promised to show improvement, he was told that he might come to work the following Monday morning at \$4 a week. He did so, and at the end of the first week found that the salary paid him had been increased to \$5, without request or discussion. He continued in the discharge of whatever duties came his way, with a gradual and satisfactory increment of compensation, for six years, during which time he had gained the respect and confidence of his employer.

In 1878 Mr. Smith began to look about him for some

opportunity of increasing his usefulness to the business, which at no time had he felt any desire to leave. He first essayed tentative work in the fields of subscriptions and advertising, and although meeting with but indifferent success displayed qualities which won approval. After a brief visit to the West Mr. Williams sent for him and asked him how he would like to go to Chicago as resident representative of the paper. He was frankly told that a better man would be sent if one was available, but that if he was successful he could count upon the sympathy and support of the home office and that his career was of his own making.

He was accordingly sent to Chicago and opened the office in that city on the first of January, 1880. This office was located on the southwest corner of Clark and Lake streets and was successfully conducted until September, 1883, when for reasons deemed good at the time he was transferred to the management of the Cincinnati office, previously conducted by T. T. Moore. This office was located in the Builders' and Traders' Exchange. Not deeming it suitable for the purpose, Mr. Smith at once made arrangements to secure better and more dignified quarters and rented an office on West Third street. When this was outgrown it was removed to Fourth and Main streets and subsequently to the Pickering Building, Fifth and Main streets.

The entire period of Mr. Smith's connection with *The Iron Age* exceeds 33 years, 22 of which have been passed in Cincinnati. During this long term of service great changes have occurred in this field, and it is now like another city, in all that contributes to its commercial and industrial importance. At the time of the opening of the Cincinnati office in 1883, the principal interests represented by the David Williams publications were cast iron heating and cooking stoves, steel ranges, pig iron, hardware jobbing and tin, japanned and stamped ware products.

The value of machinery, machine tools, &c., manufactured in Cincinnati in 1904 was \$15,000,000. The number of firms engaged in this branch in 1883 was 13; the number in 1905 was upward of 75. The firms named in the 1905 list produce the very best character of machine tools in the world, their product being distributed over the two hemispheres, and the Governments of leading foreign countries placing annually extensive orders for tools with them. The product includes almost every variety of tool used in the machine shop, planers, shapers, milling machines, lathes, grinders, drill presses, radial drills, &c.

The strike of the stove molders in 1885, which led to the formation of the Stove Founders' National Defense Association as an adjunct to the National Association of Stove Manufacturers, brought about great changes. The Cincinnati stove industry, then at its best, has dwindled to comparatively nothing. The iron (manufactured) industry has also met with considerable change. But perhaps the greatest change has been in the machine tool production, this being larger than any other portion of the United States, springing from comparatively speaking nothing.

The iron roofing and corrugated iron industry at one time was centralized here, but has in point of numbers retrograded very much. This industry was represented in 1883 by nine firms, while 1903 reveals but six; nevertheless the output in tonnage is greater to-day than in 1883.

The city of Cincinnati is deprived of the significance which it really has in comparisons of population because a large portion of this centralization is separated from the records of the city corporation. The city proper and

the adjacent belongings represent considerably over 550,000 of population. The growth is not rapid. The locality is one of steady and substantial progress in development. The facilities for rapid transit in and about the city are unexcelled. The industrial activities of this locality largely represent manufacturing operations covering a wide range of lines and interests. The number of establishments, large and small, reaches about 8000. The capital employed is about \$150,000,000. The value of real estate occupied is about \$75,000,000; number of hands employed, about 120,000; value of product in 1904, about \$320,000,000. In various lines the city leads and in many others is notably prominent in comparison with other manufacturing centers. In the past ten years there has been decided industrial growth, as evidenced by the increase in the yearly comparisons of value of local manufacturers, while the average of prices has been lowered.

Chicago.

Recognizing the rapidly growing importance of Chicago as a manufacturing center in the metal field, in addition to its uncontested position as a distributing center, Mr. Williams in 1887 decided to establish a branch editorial office there. For years there had been a feeling in the West for keen rivalry with the seaboard metropolises, and there seemed to be some danger that the interrelation of the interests of the two sections of the country might be misunderstood. George W. Cope, who was appointed the resident associate editor, grasped the opportunity with vigor, and during his incumbency by his industry, intelligence, tact and personal magnetism did much in the field of the metal industries to dispel a feeling which, while it did once exist, is now well nigh forgotten. Called to greater responsibilities at the home office he was succeeded by W. T. Partridge, who had for years been Cincinnati's market correspondent of *The Iron Age*, and later by R. R. Shuman, a journalist who had been connected with the Deering Harvester Company and with Ryerson & Co., the iron merchants in Chicago. During the current year Adolphus O. Backert has become Western editor, with headquarters at Chicago. Mr. Backert's experience was gained in part with Cleveland papers, his work in the later years of his connection with the daily press being chiefly in the trade and industrial branches. In 1899 he became editorial representative at Pittsburgh of the *Iron Trade Review*, and in August of the current year he was appointed to his present post at Chicago.

A. A. Ainsworth.

Mr. Ainsworth, who became manager of the Chicago office in 1905, began life on a farm at the age of 12 and two years later was working with a bridge gang on the Ontario & Western Railroad. After a few years connection with a boot and shoe manufacturing plant, Mr. Ainsworth began his newspaper experience by starting a weekly at South New Berlin, N. Y. Two years later he joined the Binghamton *Daily Republican* as advertising manager and subsequently went with the *Home Magazine*, published by the Commercial Travelers' Association. He became identified with trade journalism when he joined the staff of the *Plumbers' Trade Journal*. In May, 1903, Mr. Ainsworth was appointed a special business representative of *The Metal Worker, Plumber and Steam Fitter*, published by the David Williams Company, and during the current year assumed the larger responsibilities as manager of the Chicago office. Mr. Ainsworth's principal assistant is A. O. Backert, the Western editor.

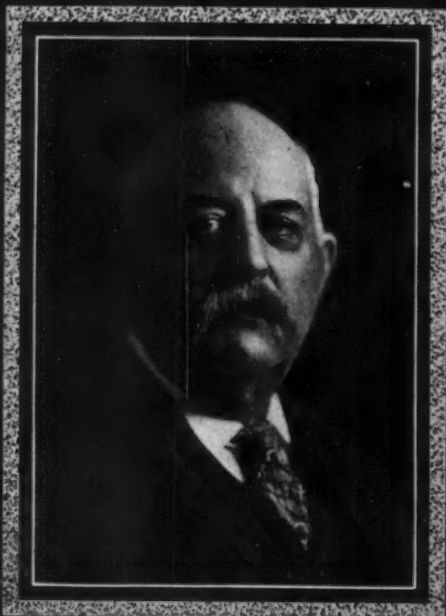
Boston.

In 1888 the Boston office of *The Iron Age* was established at 149 Congress street, and, although not among the first, immediately assumed an important position. Handling the business of the six New England States it grew rapidly and steadily and still continues to prosper.

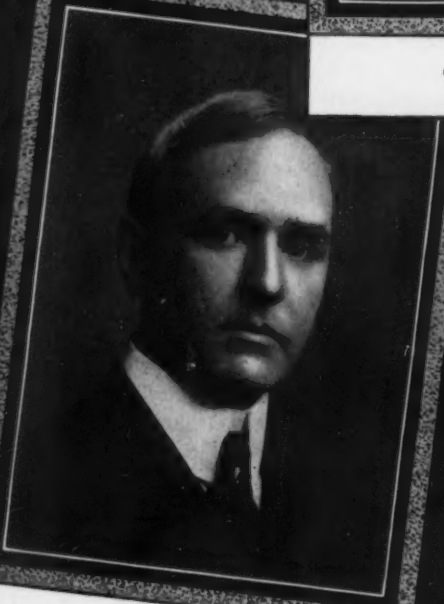
Walter C. English.

Walter C. English, who has been manager since its establishment, entered the employ of David Williams through the Philadelphia office, of which Thomas Hobson was manager, in 1884 at the age of 20, and showed such aptitude for the business that after remaining in Pennsylvania for one year Mr. Hobson sent him to the home office in New York, with the recommendation that his services be employed in some wider field of usefulness. There being a vacancy in New England Mr. English was allowed to go into that territory seeking new business, and was successful in his new field from the beginning. After he had traveled in the territory for three years with the New York office as headquarters, it was decided to establish a New England office in Boston, and accordingly in 1888 it was opened in one small room at 149 Congress street, with Mr. English as manager. Since that date, 17 years ago, the office has been moved three times, and is now located in the Compton Building, 161 Devonshire street. As the business of the office increased more room and more help were required, so that at the present time several assistants both in the advertising and editorial departments are employed.

In looking back over the period of 20 years during which Mr. English has been closely associated with manufacturers in all parts of New England, he expresses the opinion that the character of the metal industries in that section has changed very little, and that the general progress has been satisfactory. Then, as now, there are those who thought that other sections of the country nearer raw material and fuel would not only close outside markets to it, but would seriously encroach upon its own territory. Happily these views have proved to be wrong, notwithstanding the great growth in other parts of the country. In seeking reasons for the continued prosperity of New England it is generally accepted that the diversity of her products together with a skill and experience in manufacturing which comes from generations of a people noted for industry and inventive genius are perhaps the more prominent, although the possession of ample capital has been a factor. New England not only knows how to produce, but how to sell, and a glance through the advertising pages of *The Iron Age* of the present will give an excellent idea of the variety of its products. There also will be found evidence of the faculty always possessed by the Yankee—namely, that of keeping his wares abreast of the times and letting the world know about them. New England to-day, even more than it did 20 years ago, tells you if you want anything in the metal line she has it, whether it is a machine or the smallest article of hardware. While Boston is not celebrated as a manufacturing city, the State of Massachusetts has an enviable position, and there are within her borders many concerns in the metal line of world wide reputation. The great hardware factories located in the State of Connecticut have grown almost beyond belief, and that State now produces a surprisingly large percentage of the builders' hardware of the world. In contrast to the numerous large modern plants to be found in various parts of that State there still remain a number of small factories located in the country along water courses, some of them depending entirely upon water power. Now and then one of these isolated plants is



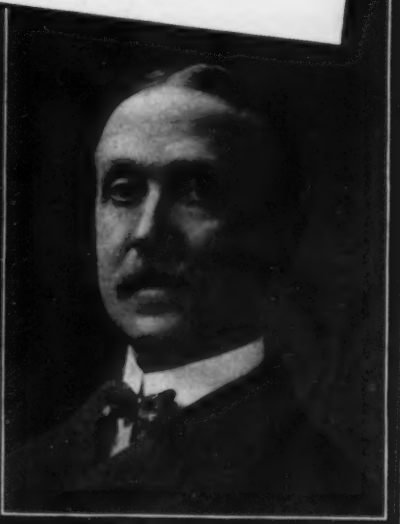
THOMAS ATKINSON



S. S. RECKEFUS



A. A. AINSWORTH



EZRA S. ADAMS



FRED. W. SCHULTZ

abandoned, but for the most part they are still running, many of them having outgrown the water power and added supplementary steam. Not only in Connecticut but throughout New England generally there will be found located almost side by side some of the most complete manufacturing plants in the world and others entirely out of date. The small State of Rhode Island also, principally in the cities of Providence and Pawtucket, has some of the foremost concerns who are well known to the readers of *The Iron Age*. New Hampshire and Vermont produce a variety of wood hardware, and have also a few works whose metal products find a wide market. The State of Maine, although principally renowned as a summer home and an agricultural region, shows a steady growth in the value of her manufactured products. In the first numbers of *The Iron Age* New England advertisers held a prominent place, and at the present time, after a lapse of half a century, their announcements show that prosperity abounds, and it is the opinion of even the more conservative manufacturers that there is every prospect of its continuance. Probably in no other section of the country have manufacturers so successfully cultivated foreign markets, and to-day many articles of New England manufacture are standard abroad. The development of the machine tool business has gone along steadily, and in the department of small tools particularly New England leads the world.

One remarkable feature of the past 20 years is the comparatively few deaths among prominent manufacturers in the metal trades. There are some notable exceptions, however, but for the most part the men who were at the helm when Mr. English first began to travel the territory are still in command of the plants they created.

A number of years since Mr. English associated with himself in his work his brother, Chauncey F. English.

Ezra S. Adams.

In 1882 Ezra S. Adams, having sold his interest in *The Trade Review* (now *The Iron Trade Review* of Cleveland), which was founded by his brother, G. H. Adams, K. H. Stone and himself in 1869, began soliciting business for the David Williams publications and other trade papers. In 1893 the Cleveland branch office, covering Cleveland and manufacturing towns in northern Ohio, was established in its present location, the Cuyahoga Building, Superior street, Mr. Adams becoming manager of same.

Thomas Atkinson.

The connection of Thomas Atkinson with *The Iron Age* dates from January 1, 1881. His earlier business career was with the hardware business, so that his entire period of such associations covers a term of 50 years.

In the greater part of the 20 years preceding January, 1881, he was engaged in traveling and selling merchandise for a house quite prominent as importers and jobbers of cutlery, fancy hardware and sporting goods in Boston. When in 1860 he went with this house it was Martin L. Bradford & Co.; later it became Bradford & Anthony. Their successors of to-day are Dame, Stoddard & Co.

It was during his early occupation in selling the trade in the West and Northwest that he made the acquaintance of S. K. Marks, then a traveler for Harvey Pease & Son, manufacturers of saws, and also interested at that time in extending the circulation of *The Iron Age*. Mr. Marks afterward was engaged as one of the office force of *The Iron Age*, and through him Mr. Atkinson came as one of its staff.

Shortly after Mr. Atkinson's engagement Mr. Williams gave him instructions to go West for three months or more and visit manufacturers in any way interested in *The Iron Age*, to learn what he could of such interest and report. Mr. King's instructions were somewhat more specific and were accompanied by rate cards, advertising contract blanks, &c.

The trip was completed, as the route given was without restrictions and embraced New York State, Cleveland, Chicago, Detroit, St. Louis and Cincinnati and many other points.

The following years, prior to the establishing of offices and managers in the several cities, continuous trips were made by Mr. Atkinson and pioneer work done, some of the results of which are still manifest in *The Iron Age* advertising columns. When a visitor to the trade in the earlier years, Boston and other New England points were worked at intervals of his stay in the East.

C. C. Taintor.

One of the oldest members of the business staff of *The Iron Age* and its allied publications is C. C. Taintor. Employed originally on *Carpentry and Building*, his experience as a builder and later with the *Manufacturer and Builder* fitting him for this work. It gave him the acquaintance of nearly every manufacturer and dealer in tools entering into the building trades, such as wood working machines, mechanics' tools, &c. A great many were not only customers but were personal friends which it has given him pleasure to retain to the present day. Mr. Taintor's work, which has consisted largely in opening new fields of business development, has covered a wide range and been of great value. He is a man of sound and conservative judgment and in 1905 was withdrawn from canvassing to undertake other duties no less important, but in which his wide experience and extensive acquaintance had special value. His connection has at no time been exclusively with *The Iron Age*, but his intermittent work for it as a pioneer in new lines of development has been of the greatest and most lasting value.

Fred. W. Schultz,

who represents the business department in the metropolitan district, became interested in newspaper work at an early age, and in 1892 realized his ambition by securing a position with the *Daily Advertiser* of Newark, his native place. After obtaining a foothold as a reporter on that journal he served successively on the Newark Sunday Standard, the New York Journal and the Newark Evening News, doing at the same time reportorial work on the leading New York dailies. In 1896 he took charge of the catalogue and publicity work of the well-known firm of Gould & Eberhardt. At the same time he took evening courses at the Newark Technical School, working one-half of each day in the machine shop to acquire some practical knowledge of the business. Early in 1898 Mr. Schultz joined the editorial staff of *The Iron Age*, and last year assumed his present position.

John A. King.

A well-known and valued member of the business staff of *The Iron Age* is John A. King. He is the son of John S. King, and his business career was largely shaped by the influence of his father. In 1888 he entered the composing room of *The Iron Age* as an apprentice and served in that capacity for four years. He then became a printer and so remained until 1897, when he was taken into the office and given a line of advertising to look after.

The Printing Plant.

There is a story in the making of *The Iron Age* each week which has never been told, but is nevertheless a most interesting one, and one that on this occasion may be told with justifiable pride. Little does the subscriber realize when each week he picks up his copy of *The Iron Age* of the mechanical achievement called for, the great plant and energy required to bring to him just as promptly as his New York daily paper a magazine more than twice the size of the average popular monthly. Not only does the publication leave New York with the daily papers every Thursday morning, but its news columns contain the telegraphic reports of the late important doings in the world's iron, steel, metal, machinery and hardware marts, gathered right up to the time of going to press on Wednesday night. The prime essential therefore is the very latest news presented at the very earliest moment possible—this is the theme of the enterprising

form was maintained until 1873, when it contained so many sheets that it was inconvenient to read and difficult to preserve. By that time it had grown to be the largest newspaper in the world, and the sheet was reduced in size to about twice the size of the present form. This change was made in January, 1873, and as the sheets were trimmed and stitched the innovation met with immediate popular approval. The example was quickly followed by many technical and trade mediums and the popular weeklies, several of which are maintaining practically the same form to-day. In 1888 the present size and magazine form was adopted, a change at the time most radical. *The Iron Age* was the first periodical to take this form and size, and the wisdom of the step is well attested by its almost universal adoption as a standard by the trade press generally. The common use of this form makes it difficult to-day to comprehend the

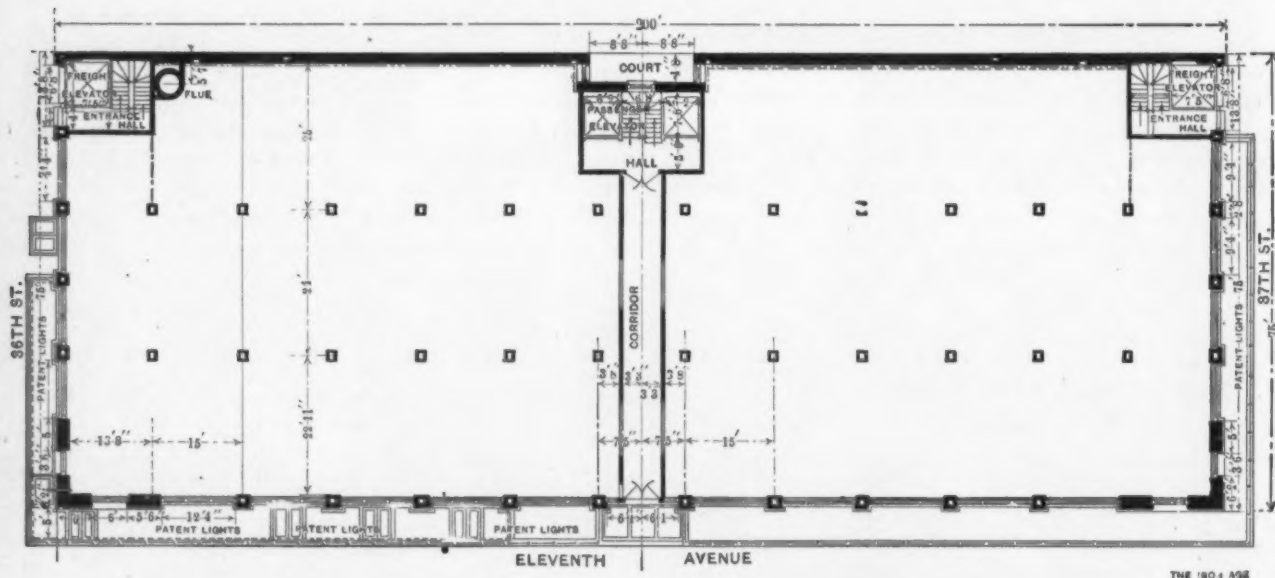


Fig. 1.—Floor Plan, Showing the Location of the Main Entrance, Corridor, Halls, Elevators, &c.

newspaper, and is accomplished daily by the newspapers of every large city. The field covered by *The Iron Age*, however, demands more than this. It calls for a publication of magazine form containing many illustrations, most of the engravings being made by the half-tone process and requiring much care and considerable time in the printing. The perfecting rotary press has solved the problem of printing for the newspaper, but it has not yet arrived at that stage of perfection demanded by the technical journal.

Furthermore, the magazine form of *The Iron Age* presents a problem of considerable magnitude so far as the binding of it is concerned. In short, the production of *The Iron Age* requires not only the issuing of a weekly publication on newspaper schedule, but the issuing of one having in its make-up all of the elements that ordinarily defy speed, whose retarding tendencies in this particular case must be and are overcome.

It is the manner in which this is accomplished that may prove interesting at this time, particularly in conjunction with the history of the publication whose production each week brought to the surface new problems to be solved from the mechanical standpoint.

Beginning with the newspaper idea, *The Iron Age* was first printed on a sheet the size of a daily. This

difficulty of that step. At the time there were no similar standards to judge by and the mechanical difficulties seemed stupendous. There was no machinery in use for the production of such a periodical, especially at the great rate of speed required to carry out the basic principle of the publication—namely, that of promptness of service.

The difficulty then confronting the publishers was that of plant and equipment. At that time, as from the beginning, *The Iron Age* had its own composing room, but its forms were sent outside to be printed.

In 1884 it was found that the printing facilities of New York were inadequate to the demands of *The Iron Age*. It was found practically impossible to obtain the class of work demanded within the short time allowed. Good printers would not operate their plants night and day, as the work required, and it was found difficult to hold other folks' employees to the high standard of combined quality and rapidity required.

A printing establishment containing five Potter presses, the best obtainable, was consequently installed at 83 Reade street. It soon developed that the binding needed some attention, and the upshot of the matter was that a bindery was installed. The various departments were, however, laboring under the disadvantage of being

located in separate buildings, and in short order all of the operations were brought under one roof, the result being the largest plant of its kind in the city at that time.

In 1887 the mechanical department had assumed such proportions that it was found expedient to form a company to take entire charge of it, and the Williams Printing Company was organized. While largely controlled by the same interests, its management and ownership are distinct and separate. Other publishers soon learned of the admirable facilities of the Williams Printing Company, and as they were experiencing the same difficulties which had forced the establishment of this plant they were prompt in availing themselves of the opportunity of having their publications produced after the method of *The Iron Age*. The Williams Printing Company rapidly built up a large printing business, securing customers who are liberal and for whom it is satisfactory to work. Perhaps one reason why this satisfaction is mutual is that one hard and fast rule of the establishment is to take no work that cannot be done in the time specified, and, once promised, that no expense be spared to get it out on time.

Aside from *The Iron Age*, *The Metal Worker*, *Plumber and Steam Fitter* and *Carpentry and Building*, which are published by the David Williams Company, the plant performs all of the mechanical work on a long list of important publications, notably such as the *Outlook*, the *Dramatic Mirror*, the *Medical Journal*, the *American Economist*, the *American Druggist*, &c.

One most important feature of having so large an amount of "outside work" is that it permits the concentration of the immense plant required for its production upon any one piece of work at one time. All of the composition in *The Iron Age*, for instance, is done in two days, the last two days preceding publication. In this manner the rapidity of production is assured by sheer force of numbers available to be concentrated upon the work. In the printing trade *The Iron Age* has always been considered "the biggest job in the business," and outside of its own there is no plant capable of bringing it out on time.

Solving the Problems.

Within the last two years *The Iron Age* has again outgrown its plant, for the steady development of the publication has continued to impose a task of increasing severity upon the mechanical force. For instance, a short time ago it was found advisable to manufacture the printing ink used and immediately an ink making plant was installed. This is now in steady operation, producing the great quantity of ink required.

While the linotype machine has been of immense value in setting up the straight matter of solid composition, it recently became desirable to carry the same principle into the manufacture of display type, or faces of type coming outside of the scope of the linotype. As a result two automatic type making machines, properly known as "sorts casting" machines, were installed, and these are daily turning out pounds and pounds of brand new type to replace that so rapidly worn out by the hard usage it receives from the long runs each week in getting out *The Iron Age* and the other publications.

Another problem brought before the publishers in recent years through the rapid growth of the publication is that of paper. After experimenting with all suitable grades on the market it was finally concluded that to obtain a grade possessing all of the peculiar characteristics essential for the printing of *The Iron Age* it would have to be made to order. This is now being done at one of the greatest and doubtless the most modern paper mill in this country, that of the West Virginia Pulp &

Paper Company. The securing of a paper that has just enough surface to give a clear, half-tone impression and still possesses the absorbing qualities to stand printing at the very highest speed obtainable with the most improved printing machinery of the day and permit quick drying; to have just the proper weight to meet these requirements and still not so much as to make the edition too heavy for expeditious handling and mailing; this is the problem before the publisher and the paper maker. To meet it every resource of both is constantly being taxed to the utmost.

In providing a new plant a site was selected which is somewhat off from the beaten paths, being located on Eleventh avenue and occupying the entire west block front between Thirty-sixth and Thirty-seventh streets, and having a depth of 75 feet on the two streets. This locality is within a few blocks of the freight terminals of the Pennsylvania, New York Central, Erie, Lehigh Valley, Baltimore & Ohio and New York, Lake Erie & Western railroads and is also most conveniently located with reference to the new transportation facilities to be opened up by the Pennsylvania terminal and Post Office now being constructed in Thirty-third and Thirty-fourth streets.

The erection of the building for the Williams Printing Company was accomplished in very short time; in fact, in about a year after the purchase of the land the building was occupied. The moving of the entire mechanical equipment was accomplished within three weeks' time and without losing a day in publication.

The land was bought in November, 1904, and in February following Radcliffe & Kelley were appointed architects. The well-known New York engineering firm of A. R. Whitney, Jr. & Co. was retained in the capacity of engineer and contractor and the manner in which it handled the entire construction work as well as the awarding of all subcontracts and the purchase of all equipment was admirably executed.

Early in April, or almost a month before the plans of the building were finished, the excavation was started. This work was finished in the middle of July, and the work of construction begun immediately. The entire building was finished and the first press moved into it early in November, 1905.

The structure, which has been called

"The Iron Age" Building.

covers a site 75 x 200 feet. on the building lines, with the extension of vaults in Thirty-sixth street and Eleventh avenue.

It is eight stories in height with the façades of Harvard brick and stone trimmings. The general architectural effect of the building is massive on account of the deep reveals and graceful proportions provided in the masonry work, further enhanced by the simple lines of the massive cornice at the roof line. The exterior trim and iron work of the building have been treated in dark green effectively contrasting with the color of the Harvard brick.

The foundations were carried down about 23 feet to bedrock, and the southeast corner of the building and vaults and boiler room were excavated entirely in the rock. The column footings are of granite set in beds of concrete, and upon them the usual cast iron bases to carry the columns are located.

The columns are of steel, and the floor beams were designed to carry a safe gross load of 260 pounds to the square foot on the second floor and 210 pounds for the third to eighth floor inclusive. The floor system is reinforced concrete and is installed in accordance with the most modern practice to develop the full strength of the steel. The walls are of brick and Portland cement, and

all flashings, &c., are of copper. There are large skylights set in the roof to effectually act as an auxiliary to the windows on the top floor. All loft floors are finished with maple, and the ceilings and side walls, including the trim, are painted dead white, in order that the maximum amount of light and cleanliness might be obtained.

The structural layout admits of an immense area of windows, so much so in fact that fully three-quarters of the wall space on the fronts is utilized for light. The access to the building is gained by a large main entrance on Eleventh avenue. By referring to the floor plan, Fig. 1, it will be noted that a long corridor leads from the main entrance to a hall in the rear of the building. This corridor forms a sort of mezzanine floor, being level with the street, while on each side of it is clear space, as the basement is a story of about 25 feet in height in the clear, extending to the ceiling of the corridor. The stair and elevator hall is flanked by a large airshaft. There is a shaft on each side of the building, containing a freight elevator and stairway leading to all lofts. In the center shaft the elevator equipment consists of two Otis passenger lifts, while in each of the side shafts is a latest type Otis freight lift designed with large capacity and so located that trucks may be loaded directly from the cars. There is also an Otis sidewalk lift of 4000 pounds capacity on the Thirty-sixth street side of the building, used for taking paper to the press room.

Fire Proofing.

The building is constructed along the lines of the regulations of the Board of Fire Underwriters and embodies the most modern and advanced ideas of fire proof construction in commercial establishments. Each shaft is inclosed in heavy fire proof walls and access is gained to the lofts through standard underwriter fire proof doors. So thoroughly has the work of fire proofing been done that this building is considered by the insurance companies as one of the best risks in New York and in consequence it enjoys the best insurance rate of any building of its size and nature in the city.

The building is completely lighted by electricity, a system of electric wiring being run in loricated conduit controlled from conveniently located panel boards in each story. Power lines have been run through conduits to each story and the entire electric equipment of the building is transmitted through a large switchboard placed in the vault on the Eleventh avenue side.

The plumbing provides for two toilets on each floor, ample and complete, besides which wash sinks, &c., are properly distributed for the use of employees. The heating of the building is done by low pressure steam with direct radiation, the steam mains and radiators maintaining a temperature in all parts of the building of 70 degrees in the most extreme cold weather.

The steam is generated by a 125 horse-power Babcock & Wilcox water tube boiler, located outside of the building in a vault. This boiler is being used for heating purposes temporarily, it being intended for high pressure work at a later date, when a complete electric generating plant will be installed.

Machinery Electrically Driven.

All of the machinery in the building is operated electrically, Crocker-Wheeler and Westinghouse motors and Cutler-Hammer controllers being employed. At present the current is secured from the New York Edison Company, but all arrangements are made so that a generating plant can be installed at short notice. In fact, the equipment is such that in case of an emergency the plant can generate its own current within 24 hours. The wiring all emanates from a large double switchboard

located in the Eleventh avenue vault, and is so arranged that the current can be taken from the street surface or the generating plant of the building, as desired. Each floor has its own switchboard, and as the machines throughout the plant all have individual motors a controller is furnished for each machine. In the boiler room are located three Brooks centrifugal pumps, each direct connected to a Westinghouse motor. One is used for boiler feeding and the other two elevate the water to two 5000-gallon storage tanks located on the roof. These are fitted with an electric device for automatically keeping the tanks filled. They are used for both house and fire service and are so arranged that it is impossible to draw upon the fire supply for house service.

The Mechanical Layout.

The three lower floors of the building are given up to the Williams Printing Company, the press room with its heavy machinery naturally being located in a subbasement whose level is 10 feet 6 inches below the street level, while its ceiling is 13 feet above it, thus giving the press room a clear height of 23 feet 6 inches. For 122 feet of the frontage on Eleventh avenue and on the whole of the Thirty-seventh street frontage a light well is provided, so that there are two tiers of windows which shed a flood of light into the press room. The rest of the Eleventh avenue frontage and that along the Thirty-sixth street frontage has vault space to the curb, the light for the printing room being furnished by the upper tier of windows, which is 12 feet deep.

The experience of printers who have been forced to locate printing presses on the upper floors of even the stanchest of modern steel frame buildings has made a location of them on *terra firma* one to be devoutly desired. For this reason the basement was chosen for the press room, all of the presses being on a solid foundation independent of the piers for the building. This guarantees the building against vibration and safeguards all the occupants of the other floors against the annoyances of jarring machinery. The entire second floor is devoted to the bindery, and on the third floor the composing room is located. The necessity of placing the press room on the lower floor breaks the theoretically ideal arrangement of having the departments related to one another in the same sequence as is followed by the various operations of publication. If such an arrangement were really necessary for continuity of operations the press room would be interposed between the composing room and the bindery. As it is, the excellent elevator facilities reduce the loss of time due to the present arrangement to insignificance. With the exception of the breaks occurring between floors the process is a continuous one, and may be summarized as follows:

The Process.

The manuscript is received in the center of the composing room and is distributed among the linotype operators and compositors to be put into type. The type passes onto the "stones," where it is arranged in forms, which are locked up and sent down to the press room on the elevator on the Thirty-sixth street side of the building. The presses are arranged so as to necessitate as little handling of the forms and the printed sheets as possible, and the latter are sent up to the bindery by means of the Thirty-seventh street elevator. The folding machines are located as close to the elevator shaft as space will allow, and the great flat sheets are folded to size and pass in a steady stream toward the Thirty-sixth street side of the building, going directly to the collating or gathering machine. Here the proper signatures are assembled in their regular order into sets, which are



Fig. 2.—View in the Composing Room, Showing the Ten Linotype Machines.

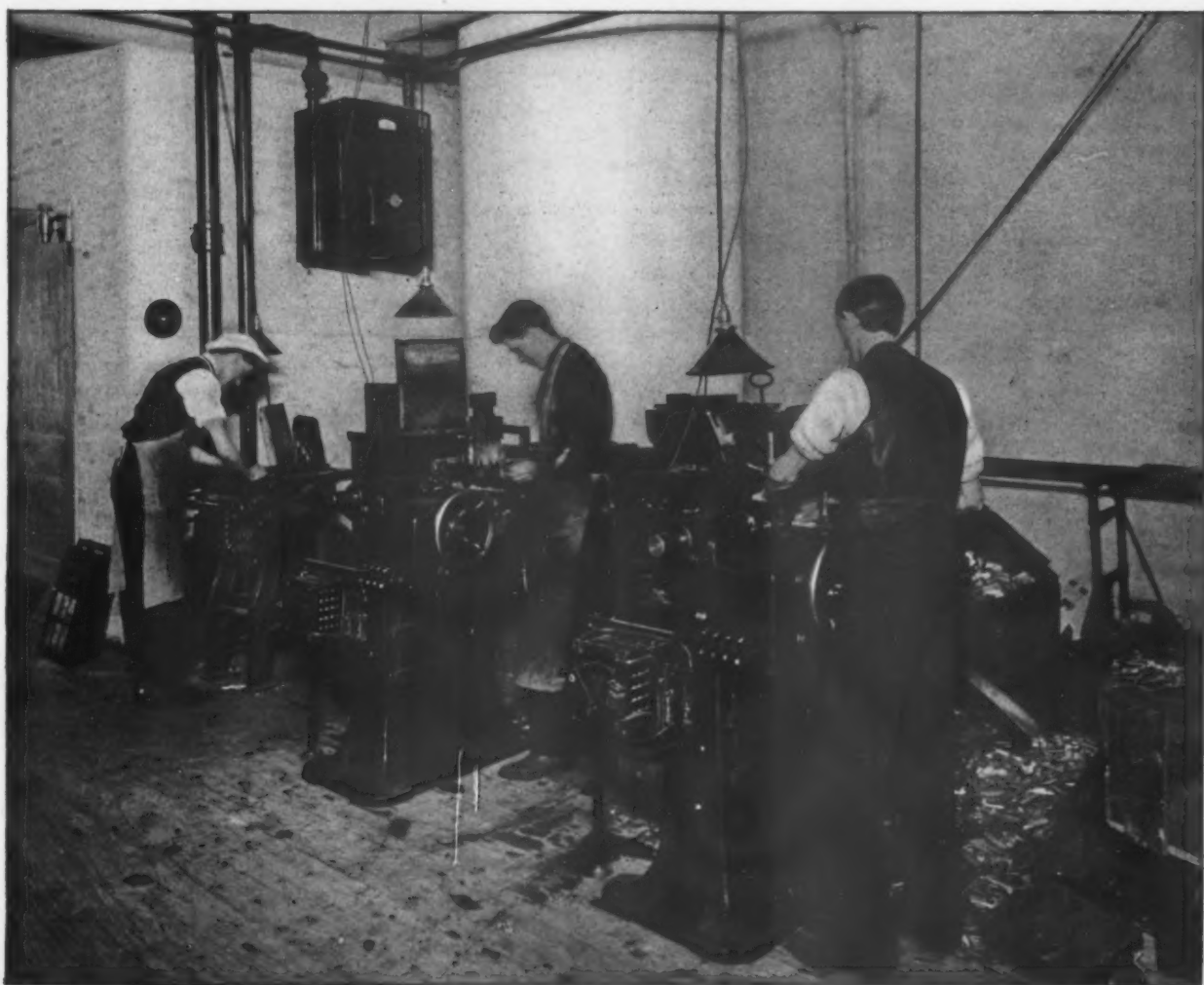


Fig. 3.—The Automatic Sorts Casting Machines, Used for Manufacturing Display Type.

immediately taken in hand at the wire stitching machines. The book is then ready for its cover and passes to an automatic covering machine, where it is given its outside dress.

The book is then ready to have its edges trimmed, which operation is performed at the machines immediately adjacent to the covering machines. The mailing table is at the elbow of the cutters, and as fast as the mail bags are filled they are sent down a chute to wagons waiting beneath it on the Thirty-sixth street side of the building. An interval of about 50 copies exists between the mail bag and the press room, and so, after once the printing is begun on Wednesday night, the shipping of the finished copies to the furthestmost parts proceeds continuously and simultaneously with the printing.

The Composing Room.

Some idea of this department can be obtained from Figs. 2, 3 and 4. The foreman's desk is mounted upon a platform just high enough to command a good view of the entire floor, and located in the center. One-half of the floor is devoted entirely to the linotype machines, the cases for hand typesetting and the stones for making up the composition into forms. A view of it is shown in Fig. 2, the wall in the distance being the Thirty-sixth street side of the building. On the left of the picture is shown the row of ten linotype machines. These are used for setting the body type used in the editorial section of *The Iron Age*; in the center of the row the foreman having charge of these machines has his desk, and it is so arranged that he can constantly command a view of all the operators. In back of the machine will be seen a long platform, which is used by the machinist, whose duty it is to maintain a constant inspection of the machines and keep them in steady running order. Each of the machines is run by a small Crocker-Wheeler motor, mounted on the floor and belted to the main driving pulley. These machines have during the last ten years revolutionized the art of typesetting, one machine doing the work of at least four hand compositors, and at the same time making its own type. Speaking in the language of the printers, the machines are each capable of setting about 5000 ems of type per hour, but the attainment of this is, of course, dependent upon the expertness of the operator in fingering the keys. The average operator turns out about 4000 ems per hour, although on certain classes of work expert operators have attained a speed as high as 8000 ems per hour.

Type Making Machinery.

The linotype is not a typesetting machine. On the contrary, it is designed to do away with ordinary type, and with composition and distribution. It is a machine controlled by finger keys, like a typewriter, which creates new type matter as demanded, ready for the press or stereotyping table, to be once used, ordinarily, and then melted down. Instead of producing single type characters it casts type metal bars or slugs, each complete in one piece and having on the upper edge, properly justified, the characters to print a line. These slugs present the appearance of composed lines of type, and for this reason are called "linotypes." The linotypes, or slugs, are produced and assembled automatically in a galley, in proper order, answering the same purpose and to be used in the same manner as composed type matter. After being used the slugs, instead of being distributed like type, with the attendant expense, are simply remelted into linotype metal. When a line of matrices is once set, any number of duplicate slugs may be cast from it automatically. Matter is kept standing at the mere cost of type metal.

The linotype machine, however, is adapted only to the setting of solid matter, and the printer has still had to purchase material, such as display type, characters, ornaments, spaces and quads, for the balance of his composition, usually representing about two-thirds of the required material, and also endure the annoyance and disadvantage of being out of "sorts" and the anxiety as to whether the case contained sufficient type to produce the work in hand. The advent of the "sorts caster" recently put on the market by the National Compositing Company, Baltimore, Md., has placed at the command of the printer a machine which will enable him to produce in his office all the above type, and when necessary body type without engaging skilled labor for the work. Two of these machines are shown in Fig. 3. The machine is an exceedingly simple one, occupies a floor space 27 x 45 inches, weighs about 800 pounds, and will produce accurate and uniform type of standard dimensions from 6 to 36 point. The actual casting or injecting of the molten metal into the mold is done under a pressure of 200 pounds to a square inch, giving perfect type with sharp, clear, definite corners. The method of producing and holding the parts of the mold and the injecting operation are features which will probably be of special interest to those familiar with the vacuum system now used for the perfect casting of small articles.

The three main parts of the machine are a self-adjusting mechanism which places and clamps the mold ready for casting, an automatic regulating mechanism which injects into the mold the exact quantity of metal at the proper density for the cast required, and a self adjusting mechanism which finishes and ejects the type. The body size of the type is determined by interchangeable mold parts, which are inserted in a stationary mold part, permanently secured to the frame. The inserted mold parts are merely laid in the machine in their proper position, and are automatically clamped in correct relation to the stationary mold parts without occasioning the operator to use his discretion. To provide the proper width of type, graduated liners, stamped with the size to which they correspond, are used. These are placed in the frame and limit the travel of a sliding ejector which forms one vertical side of the mold. As an illustration, if the operator wants an 18-point face 3 points wide, he selects the 18-point insert mold parts, adds the matrix for the required character, and places it with the 3-point liners in the machine, after which no further attention is needed.

The machine has an arm which, when turned down and clamped in position, covers the mold parts and forms bearings for a pair of wedges which clamp the insert molds in casting position. When the plunger carrying these parts advances or moves toward the right the beveled portion passes under the arm and locks the top and bottom parts of the mold in position. The same movement brings a tapered arm into action, clamping the sides so as to produce the correct width of type.

The fundamental actuating member of the machine is the horizontal ram, which carries the mold and is reciprocated by a crank on the pulley shaft. From this ram all of the movements are communicated; those on the mold directly and those for the pump plunger, choker and ejector through an arm connecting the ram with the horizontal oscillating rod on the side of the machine.

No measurements of any kind are required in the use of the machine, the parts being so arranged that all expansion and contraction are automatically provided for, and no after labor is necessary for producing type of standard dimensions and quality.

Hand Work.

The setting of the display type must of course be done by hand and for this purpose a large number of "cases" are placed along the Thirty-sixth street wall of the building. Here are also long racks for the storage of type after it is set and before it is made into forms. Immediately after being set the type is placed in long trays called "galleys," in single column width and about 30 inches long. These galleys of type are then sent to the hand presses, located in the center of the floor, to have proofs taken. The proofs are sent to the proofreaders and the type is stored in one set of the racks previously referred to. After the proofs have been read and such corrections as necessary made on the proof sheet the type is corrected and the galleys are placed in another set of racks placed at the "make-up" section of the floor.

proof room is located and here 12 proofreaders are constantly employed. A small space in the rear of the proofreaders' section is occupied by the desks used by the editors on publication day and the office force required for the management of the mechanical plant. The bookkeeping and clerical force is located in the Park Place office of the company.

The Job Department.

At the Thirty-seventh street end of the building the Job Department has eight presses and a full complement of machinery and typesetting facilities for turning out the job printing naturally brought to the plant in the course of the company's dealings with the publishers of the periodicals which it prints. This work also includes heavy catalogue printing and booklet work for patrons



Fig. 4.—View Down One of the Center Aisles of the Composing Room, Where the Type is Being Laid Out in Forms.

Here the type is placed on trays a little larger than the size of a page of *The Iron Age* and is arranged in pages, the engravings for the illustrated articles being placed in position, &c. After the pages are thus "made up" another proof is taken and again passed on to the proof room and editors for final revision. While the page proofs are being read the made up pages of type are taken to the "stones," where they are arranged in forms. Fig. 4 shows this work in progress. If any final revision of the type is necessary it is done on the stones just before the forms are locked up. Before each form is locked it must have an O. K.'d page proof for each of its pages. When each of the 8, 16 or 32, as the case may be, pages of the form are approved and the forms locked up they are placed on specially constructed trucks and wheeled to the elevator shaft and lowered to the press room. It may be interesting to note that the amount of standing advertising matter always kept "alive" in this department is equivalent to more than 1000 pages of *The Iron Age*. In the center of the composing room floor the

of *The Iron Age*. While the work of this department is of the highest class, the department has gained an enviable reputation in the trade for speed and promptness of service. A piece of work that attracted considerable attention a short time ago was the programme of the New York meeting of the Iron and Steel Institute, which was produced by the Williams Printing Company within 36 hours. It was a very handsome piece of work, containing 64 pages, 6 x 9 inches in size and having a rather elaborate cover feature. This is but one instance of the nature of work often placed before the Williams Printing Company, and always carried out successfully.

The Press Room.

Before entering upon a description of the actual work of the press room it may be interesting to glance at the paper receiving and storing department, which is conducted on the same floor immediately in the rear of the presses. Over 15 tons of paper is received daily, it being lowered to the basement floor by means of an Otis elec-

tric sidewalk elevator. It is received in wooden crates and cases, each case containing about 600 pounds of paper. It comes direct from the mill and the crates and cases are unpacked immediately upon their arrival, whereupon the paper is piled up in stacks about 75 reams high. These piles are tagged off by reams, so that the desired amount of paper may be quickly obtained. The great bulk of the paper comes in sheets about 35 x 52 inches in size, about five reams coming in a case. Each lot of paper is kept separate, and a lot is allowed to remain in the pile about a week before it is used. This is for the purpose of "warming it up" and taking out the electricity. There is constantly kept on hand more than 3000 reams, or 1,500,000 sheets, of paper.

The foreman of the press room issues a requisition

venient to the next press, where the reverse side is printed without any intermediate handling of the printed sheets.

There are 23 high speed two-revolution printing presses of the very latest types in the plant. They are machines embodying the continuous application of inventive ingenuity, skill in workmanship and trained experience in one of the highest branches of the mechanical arts.

Any one with an eye for artistic printing may easily applaud a pretty example of the art invented by Gutenberg. Show the work to a critical, practical printer, and immediately he inquires into the conditions under which the work was performed. Asks he, How much time was given to "make ready," to coaxing out every high light and shadow of the engraving and subduing their imper-

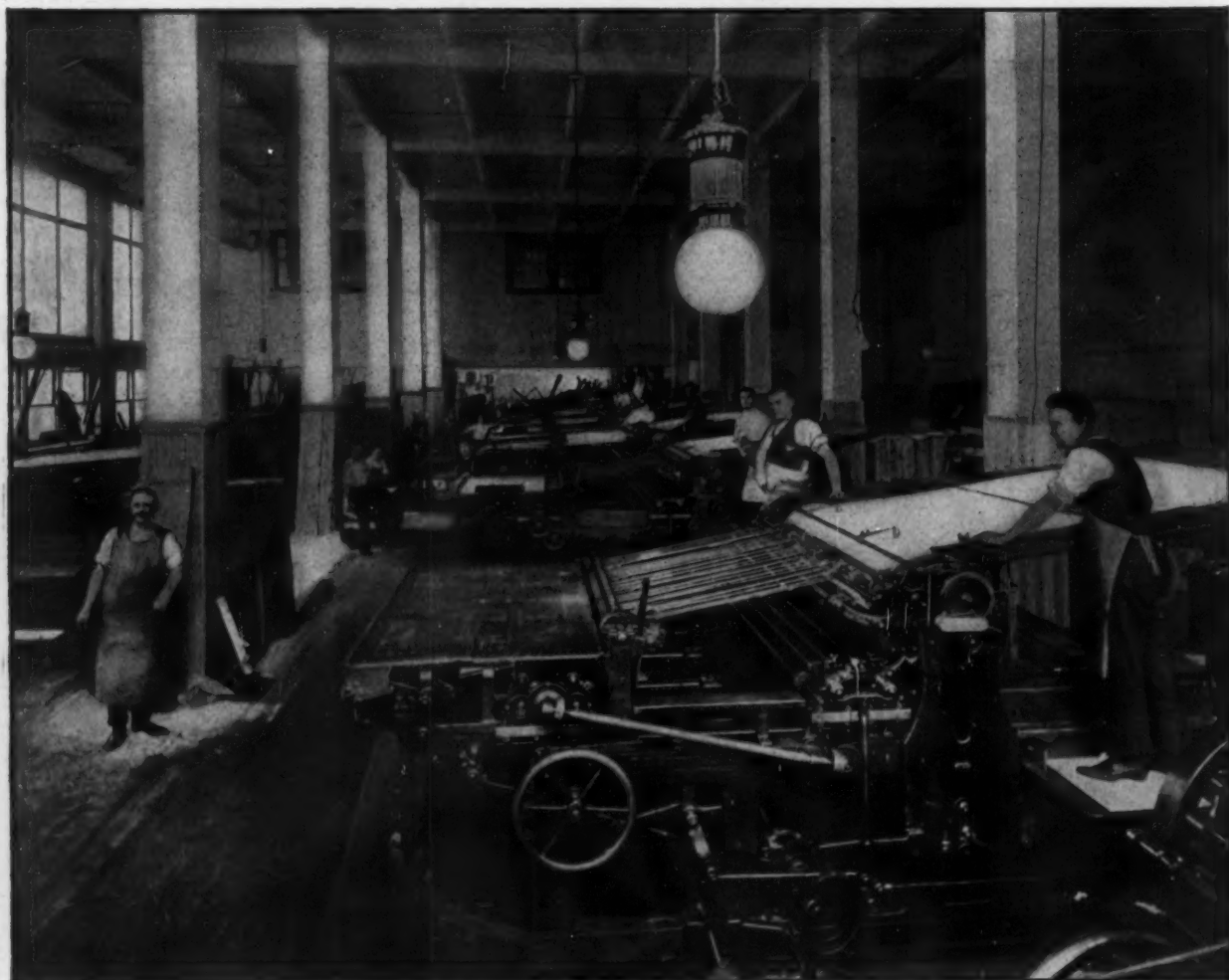


Fig. 5.—A General View in the Press Room Looking Toward the* Inclosed Mezzanine Corridor Which Crosses the Room in the Center.

upon the paper department for the amount required for the work he has in hand and it is wheeled alongside of the presses on specially constructed trucks. The moving of the paper to the presses is a very simple matter, for one of the most carefully studied points in laying out the equipment for this floor was to necessitate as little handling of material as possible.

This feature embodies the advantages not only of rapidity and economy but has also an important bearing upon the quality of the work, as in view of the high speed at which the work must be rushed through the press room, prohibiting as it does the thorough drying of the ink upon the sheets, the work is bound to blur and smut through excessive handling.

The paper is therefore stored directly behind the presses, which are arranged so closely together that sheets printed on one side may be placed in stacks con-

sections? What was the speed of running and how long the run? How much time was given for drying before "backing up," as the printer calls printing the reverse side of the sheet; and what is the finish and weight of the paper? Answer these questions in one way and your critic will say, "No wonder." Take him to witness these 23 modern half-tone presses operating at top notch speed and let him see a copy of *The Iron Age* completely printed and bound delivered on the editor's desk in less than three hours after he has sent the last piece of manuscript to the composing room and he will doubtless exclaim that it is a marvelous piece of printing.

Imagine the rigidity of construction though lightness of action required in a machine having a heavy cast iron bed, carrying 300 pounds of more of type and exciting a lateral strain of about 5000 pounds, shooting first forward then backward at the rate of 3600 times an

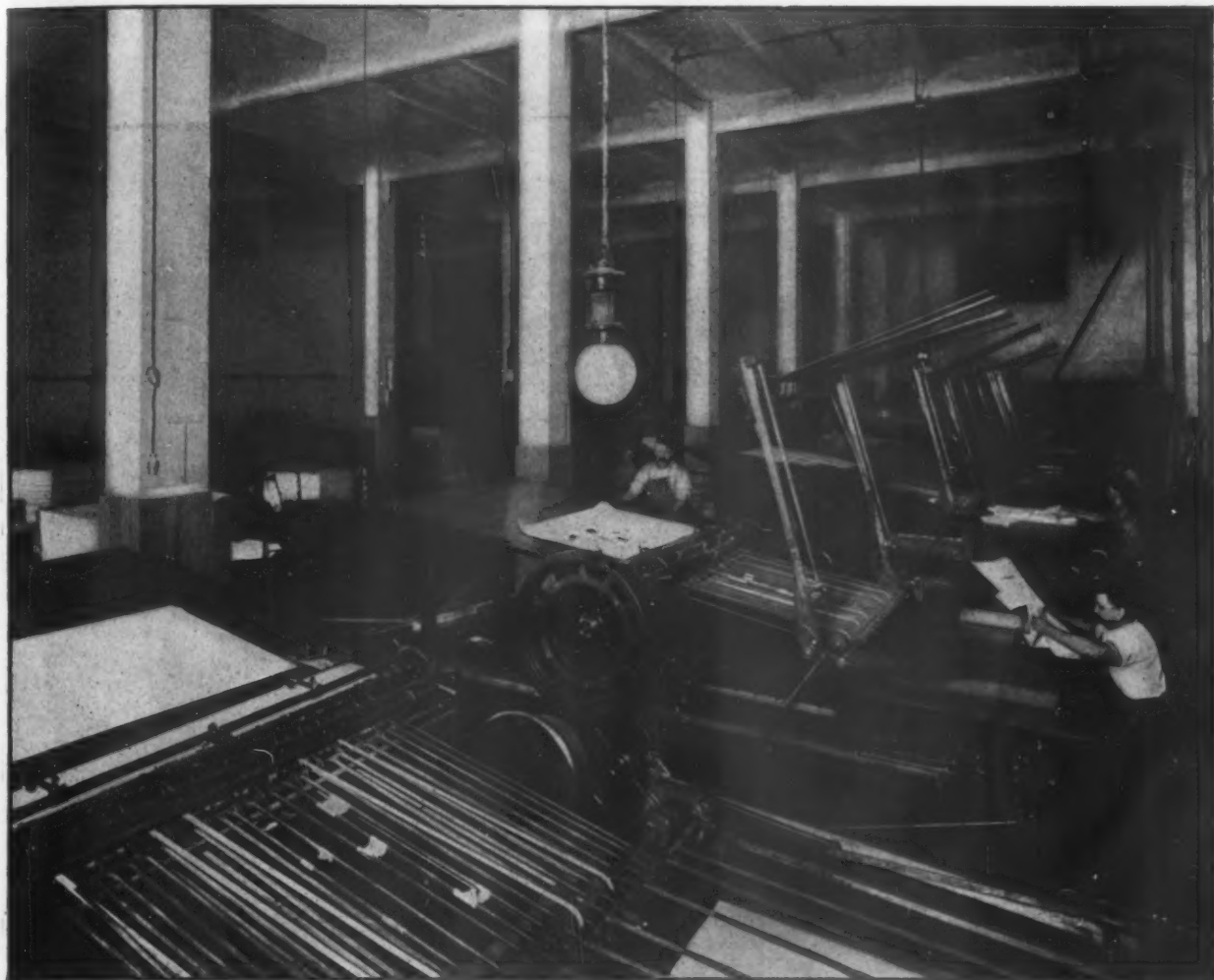


Fig. 6.—Another Section of the Press Room Looking at the Opposite Side of the Corridor and Showing Six Large Double Revolution Presses.

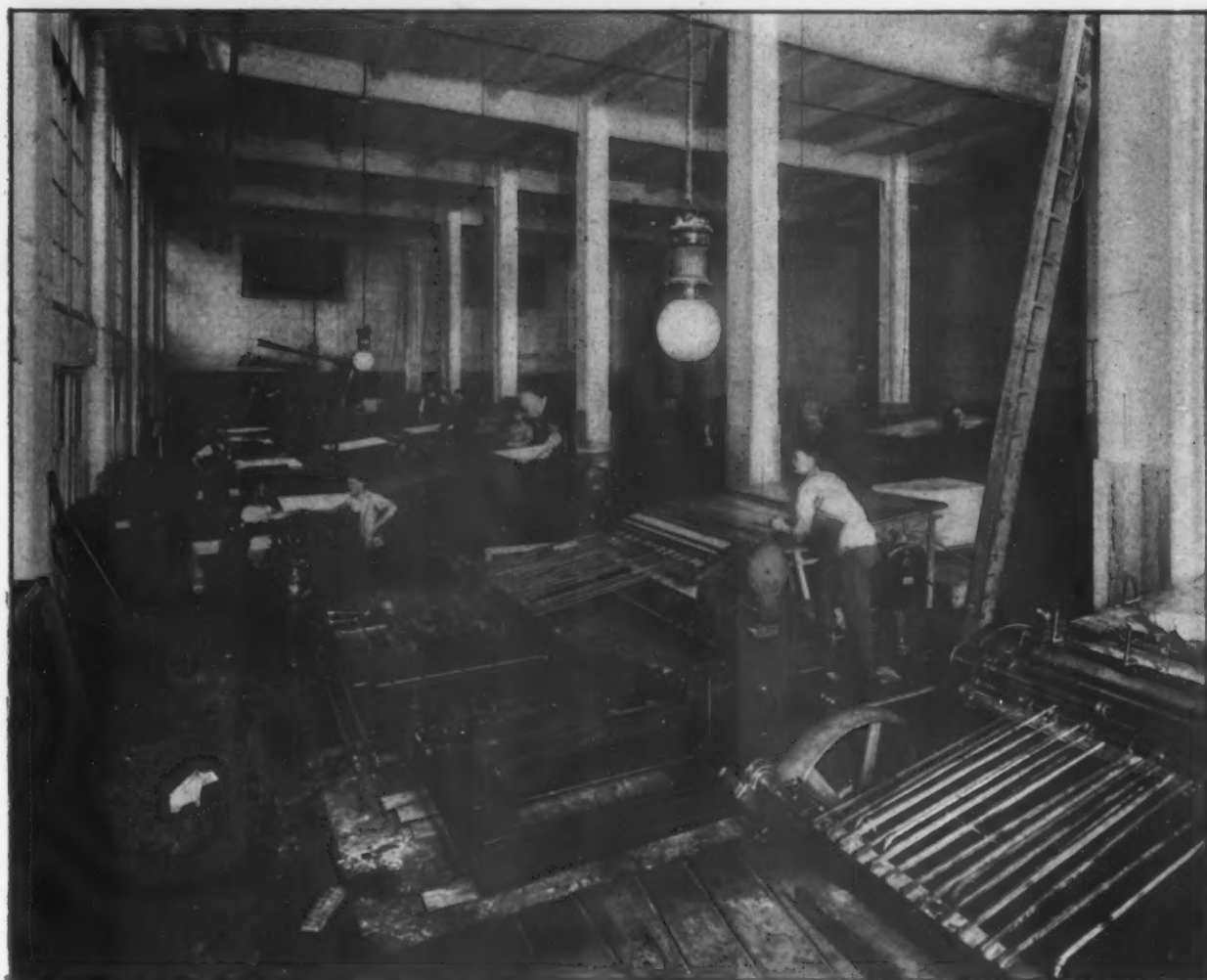


Fig. 7.—A Row of Presses Along the Avenue Front of the Press Room.—There Are 13 Presses in This Row.

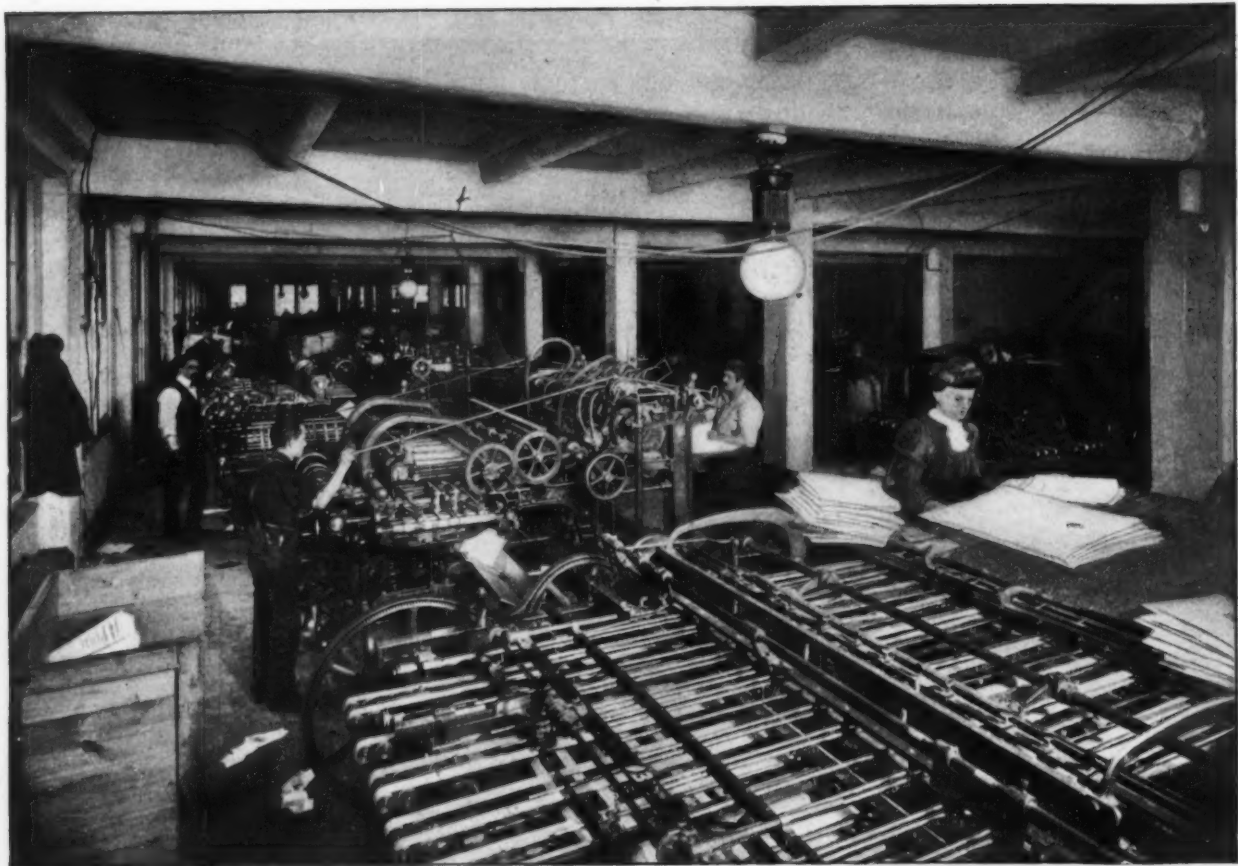


Fig. 8.—View in the Bindery Looking Toward the Thirty-sixth Street Side of the Building and Showing Some of the Automatic Folding Machines.

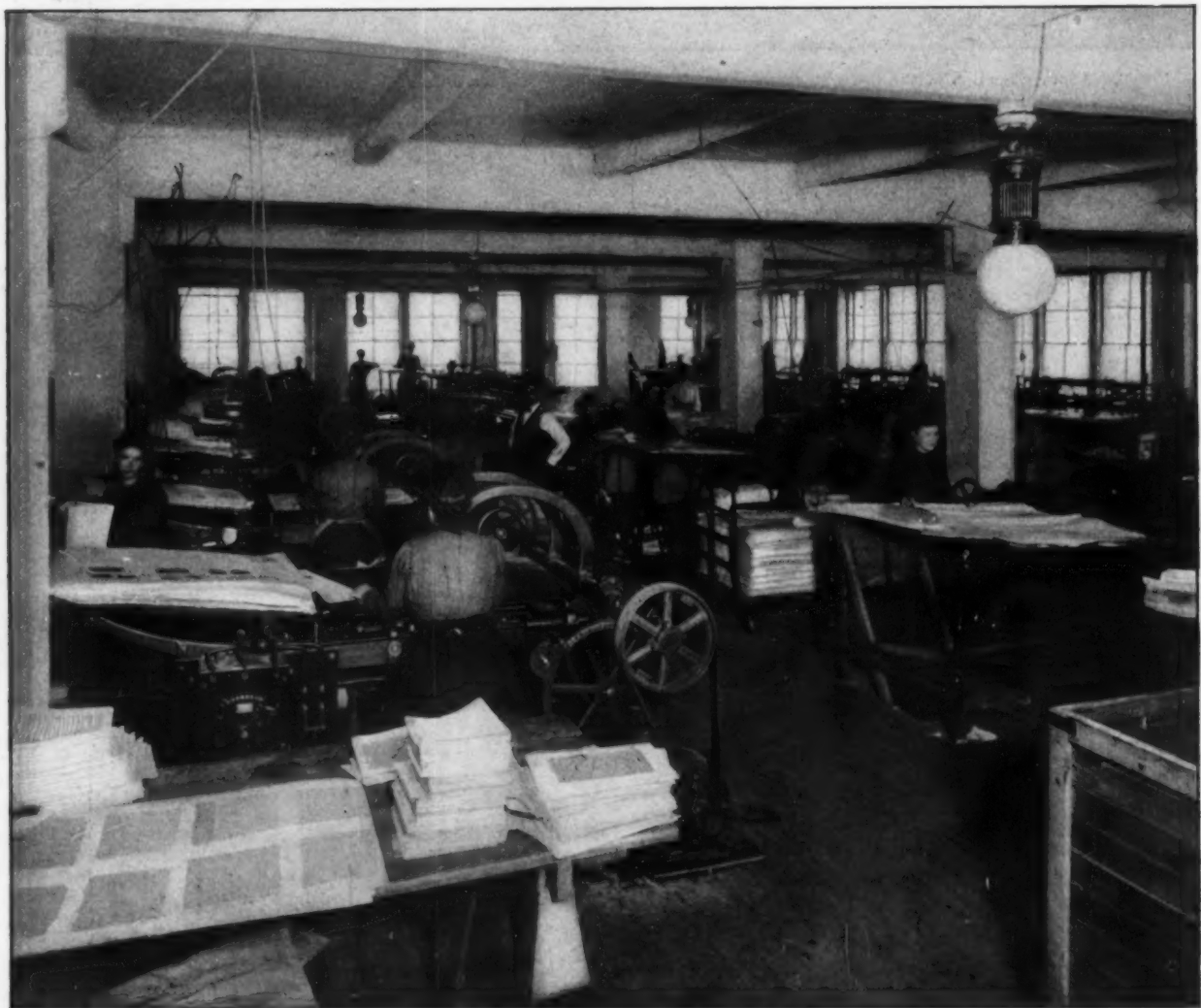


Fig. 9.—Another View of the Bindery, Showing Hand Feed Folding Machines.

hour, with a heavy cylinder around which the sheet to be printed winds itself being raised and lowered alternately with each forward or backward movement of the bed, and done with such a degree of precision that when the paper comes in contact with the type exactly the proper amount of pressure is brought to bear to transfer the ink and still have the indentation upon the paper from the type scarcely perceptible. Imagine two trains of ink rollers gradually speeded up at just the proper ratio so that the lowest takes only a little printing ink from a reservoir at the end of the press and the fastest spreads it into a wide thin film applied

you will have a faint idea of the operation and construction of a modern cylinder printing press adapted to half-tone printing. The absolute precision of movement, nicety of adjustment and positiveness of motion of the machine cannot be comprehended so readily, however, for they have been the outcome of years of patient, painstaking development taught by experience of slow growth.

The size of sheet printed on the machine as a rule is about 35 x 52 inches, each containing 32 pages of *The Iron Age*.

The presses are arranged in two rows running parallel with the avenue front of the building. Extending



Fig. 10.—The Automatic Gathering Machine.—The Only Help Needed Is That Required to Keep the Machine Supplied with Work.

to the type so uniformly that the faintest gray and the heaviest black though combined on the same form produce their effect upon the printed sheet; and imagine these rollers constantly oscillating from one side of the press to the other to distribute the ink evenly and reversing with each movement of the bed. Finally imagine a large wooden hand, with outstretched fingers, lightly taking in its palm the printed sheet as it emerges from the rear of the cylinder and tenderly placing it on the pile of printed sheets or onto an attachment which deftly turns it over so that the printed side is turned up. Then

along the entire length of the building is one row of 13 machines, while another row of 10 presses is toward the rear wall. Each of the presses is equipped with a Crocker-Wheeler motor and Cuttler-Hammer controller. Several of the machines are equipped with Dexter automatic feeders, which mechanically feed the sheets into the presses. The presses are of the Cottrell and Miehle makes.

The printed sheets as they are removed from the presses are placed upon trucks and when several thousands are thus accumulated the trucks are wheeled to

the elevator at the Thirty-seventh street side of the building and taken to the bindery.

The Bindery.

This is a most interesting branch of the establishment, and the one that is oftenest called upon to outdo itself in establishing new records for speed. As its work includes the final mechanical operations, it is occasionally called upon to make up time lost in other departments. It is the court of last resort and when anything happens in any of the other departments to cause operations to lag behind schedule, the bindery is looked to to come to the rescue. On its delivery end are mail trains that simply must be met, while at its receiving end there may occasionally be a bit of delay due to some unavoidable hitch further down the line. The manner in

latest and most advanced types and is larger than found in most of the large binderies of the country. With the exception of a line of small wire stitching machines which are driven from a motor driven line shaft every machine in the department is driven by an individual electric motor. The machinery includes 23 folding machines, all but one being of the Dexter make. Each of the machines has a capacity of 2000 sheets per hour. This is mentioned at this time simply to convey an idea as to the extent up to which this company has gone in adopting labor saving devices, as of course the speed of the entire plant is dependent upon the pace maintained in the folding of the printed sheets.

In the work of the bindery department, the continuity of process is an all essential feature, for the work



Fig. 11.—A Group of the Wire Stitching Machines in the Bindery.

which this condition is met is a simple one. A cushion is provided in the way of "outside work" for this department; that is, work that is printed elsewhere and the prompt delivery of which is not so imperative that the work cannot be laid aside for a short time in case of an emergency. This permits the bindery to hold in reserve a surplus of force that may be called upon in case of necessity to relieve unusual pressure. This is one reason why in this department there are more people employed than in any other part of the establishment. Another reason, however, is that the development of machinery to supersede manual labor in this class of work has been slower than in any other branch of the publishing plant. More has been accomplished in the way of relieving this condition during the last few years than at any time before. The mechanical equipment of the bindery of The Williams Printing Company is of the very

must follow through a steady stream. It must proceed at a very short interval behind the press room. When this is done, by the time the edition is run off of the presses the completed copies of the publication destined to travel the greatest distance can be well on their way before the copies for nearby delivery are scarcely off of the press. This is the case with *The Iron Age*.

In the bindery of the Williams Printing Company the printed sheets come in at one end of the floor and work their way through the various operations to the opposite end where, inclosed in mail bags, they are sent down a chute to a wagon waiting in the street below. The printed sheets enter at the Thirty-seventh street elevator shaft. They are taken directly to the folding machines, where each sheet is folded into the proper number of pages. The folded sheet is called a "signature" in bindery parlance.



Fig. 12.—Where the Finishing Operations Are Performed— Namely, Attaching the Covers and Trimming the Edges.



Fig. 13.—A Corner of the Mailing Department.

Of the several types of folding machines employed the majority are fed by hand. The very newest ones have most ingenious devices attached at the feeding end, however, which automatically lift the top sheet from a pile and feed it into the machine. The simplest way of describing this device would be to say that several mechanical hands manipulate the sheet with the help of compressed air issuing through four small nozzles.

The fingers of the mechanical hands have rubber tips which enable them to pick up the top sheet of the pile without carrying along additional sheets. The jet of air is directed against the edges of the sheet which blows the uppermost sheet a trifle upward. One set of the fingers immediately moves the edges of this sheet away from the others, while another of the fingers presses itself down on the remainder of the pile holding the sheets

of all sizes and varieties. These are especially adapted to work where the printing is done with duplicate sets of type—that is, several copies of the work is printed on one sheet and it is left to the folding machine to divide the sheet and fold up the books separately. Three of the folding machines mark a very distinct advance in practice, and so new are they that very few of them are in use as yet, and the three machines in this bindery constitute the largest number in any one office in this country. These machines possess the automatic feeding device contained on other machines and previously referred to, and they not only fold but trim the edges of four signatures simultaneously.

The folding machines are so located that the printed sheets coming up on the Thirty-seventh street elevator work their way down toward the opposite end of the



Fig. 14.—A Section of the Trimming Department, Showing the Knife-Grinding Machine in the Foreground.

down, and still another pair of hands grips the loosened sheet and a quick pull carries it to the guide roll of the machine.

The sheet is carried down through several series of rolls over a system of conveyor straps, a blade coming down over the surface of the paper just above each pair of rolls and effecting the fold. This operation is repeated as many times as folds are desired, the average number of folds being four. Thus it will be seen that a sheet printed on both sides, sent through a fourfold machine, will come out at its delivery end folded into 16 leaves or 32 pages. Several of these machines are arranged to do double this amount of work, two sheets being handled simultaneously. Seven of the 23 folding machines are what are termed jobbing folders, so named because they permit of a very wide range of adjustment to take in work

plant. About in the middle of the floor the folding operations cease and the folded sheets or signatures are placed on great trucks arranged into compartments, each signature being placed in its proper compartment.

The next operation in the process is to assemble the signatures, or gather into one group in their proper sequence all of the signatures required for the making of one volume. This is an operation that until very recently was done by hand entirely, and errors could not be guarded against, because even bindery girls make mistakes. The automatic gatherer shown in Fig. 10 has successfully coped with the problem and not only eliminates these errors but it is a wonderful labor saving device as well. It does the work of a host of hands with speed and mechanical precision. The only help required is that needed to keep the machine fully supplied with

work and an operator to start and stop it. The machine has a capacity of 70 books per minute, each book containing any number up to 20 signatures.

The signatures to be collated are placed in boxes located on one side of the machine along its entire length. The machine picks the bottom signature from each box and automatically carries it along its bed. For instance, the machine is started and the first signature drops onto a conveying chain which carries it to the second box or station where another signature is placed on the top of it. In this manner the pile continues to grow until the last box is reached, when the completed series is delivered to the wire stitching machines. The process of course proceeds continuously until the entire edition is completed. It will readily be appreciated that the proper timing of all of the movements is an all-essential feature of the machine. It will also be noted that measures must be taken guarding against the dropping of more than one signature at a time. So carefully is this contingency provided for that after the machine has once been set to take a signature of a certain thickness, should a heavier grade of paper be used on one of the sheets by mistake, the machine will stop instantly when that signature reaches the bottom of the box and tries to slip through to the conveying machine. It will thus be seen that if through any error of the opening and closing arrangement of the box more than one signature should try to slip through, the machine will immediately come to a standstill. Furthermore, the vertical arms containing the metal plates bearing numbers as shown along the top of the machine, are placed there to indicate the particular section of the machine where the trouble occurs. If the machine comes to a standstill through any error at box number 3, for instance, the signal will immediately drop at that point and the operator knows exactly where he can quickly rectify the trouble. Running along the inner edge of the piles of signatures there is a pipe bearing a series of holes which is connected to a suction pump at the driving end of the machine. The proper amount of vacuum is maintained according to the thickness of the signature to draw the bottom signature slightly away from the balance of the pile. A swinging arm actuated by a rocking shaft carries at its bottom a pair of jaws which are held apart as the arm is swung toward the signature just released from the pile. When the arm reaches the forward end of its travel the jaws are brought tightly together, gripping the signature, and upon the backward swing of the arm it is carried to the conveyor chain, the jaws again opening and leaving it free to be carried on to the next station.

Directly at the end of this machine the wire stitching machines are grouped so that as fast as the collated signatures are delivered by the gathering machine they are taken and stitched. There are 12 of these machines, and a good illustration of the method of operation is shown in Fig. 11. In the lower right hand figure of this engraving will be noted the delivery end of the gathering machine.

As fast as the volumes are stitched they are taken to the Lovell covering machine, where the cover is automatically attached. One of these machines is shown in the background of Fig. 12. It has a capacity of automatically placing the covers upon 68 books per minute, while another attaches 85 covers a minute. The stitched signatures are placed in a magazine at one end of the machine, while in another box located in the center of the machine the covers to be attached are placed in their unfolded condition. The body of the volume is gripped by a pair of jaws and carried edgewise over a roller running

in glue, which glues the back of the volume. As the glue covered portion passes over the box containing the covers the box is raised automatically and one of the covers adheres to the stitched volume. The volume passes in this condition around two sets of large guide wheels and an overhead track, as shown in Fig. 12, the time of this travel being just sufficient to allow the glue to dry enough to permit the volume to fall between a pair of rollers which fold the cover around it.

Within a step of these machines the cutting or trimming department is located, one of the machines being shown in the foreground of Fig. 12. This particular machine is a Seybold duplex trimmer, having a capacity of 30 books at one fall of the parallel knives. The work of this department is so simple that the operation of the machinery need not be told in detail. Seven of these cutting machines constitute the department.

In order to facilitate the grinding of the knives used on the cutters, a special machine, shown in Fig. 14, has just been added to the equipment. From 12 to 25 knives are ground on this machine daily.

There is a machine known as the smashing machine which is a huge toggle press, having a squeezing capacity of 7 tons pressure, and its work is to compress the backs of the volumes to the same thickness of the rest of the books.

The finished volumes are then placed in long piles directly back of the mailing department, which is shown in Fig. 13. Here the wrappers are all previously addressed and laid out in the proper order according to which the copies are to be sent out. They are held in readiness and as soon as the stream of finished volumes reaches the department the work of dispatching the edition is begun. It is simply a matter of filling up the wrappers and mail bags, and sending them out in the prearranged order, which provides that the copies destined to travel the greatest distance be sent off first. As soon as the mail bags are filled they are sent down through a chute to the wagons waiting below and hastened to the railway post office. A chart containing the schedules of departures of the various trains for the different sections of the country is constantly kept before the foreman of the mailing department, and it is the meeting of this schedule that calls forth the crowning effort that caps with success all the multitude of varied occupations, the stupendous energy and the mechanical triumphs combined in the production of *The Iron Age*.

The present organization of the Williams Printing Company consists of the following officers and directors:

David Williams, president.
Richard R. Williams, vice-president.
David L. Williams, secretary and treasurer.
A. R. Dressel, superintendent.
C. Kirchhoff.

A notable feature of the past year in Mexican progress was the establishment of regular service on the Isthmus of Tehuantepec Railway, an undertaking which has been carried out by a London firm with the aid of the Government. It is believed by its promoters that they are destined to divert to this route a large part of the traffic between the Atlantic and Pacific oceans during the period of construction of the Panama Canal.

The department of electrical engineering at Cornell University has so far approved of the report of the United States Census Bureau on electric and street railroads issued this year as to adopt it as a text book. This report is a large volume containing 439 pages and many illustrations. In addition to the statistics of the art up to 1903 it gives a large amount of technical and historical data.

road demand, that has pre-empted so much of our iron and steel capacity for the new year, has not yet seen the culmination of the present movement, on the testimony of a number of railroad presidents. The extensions of important lines, particularly in the West and Northwest, even though involving what has been called competitive building, only testify to the development and rapidly increasing wealth of those sections.

In a word, the outlook for the iron trade in 1906 is full of high promise. If there is any respect in which the situation to-day is not to be preferred to that of one year ago it is in being one year farther removed from the chastening influences of 1904.

The Money Market and General Business.

The abnormal condition of the New York money market has had literally no effect upon the relations of the banks and their customers in the ordinary run of business. There is nothing extraordinary in this, but it presents in another form the absolute sense of confidence in the general business outlook. If there had been the breath of suspicion that present conditions were not well based, that there was anything of the fictitious in the foundation of the existing wonderful prosperity of the country, the banks of the country would have been inclined to pull in a little and customers would have suffered correspondingly. As it was the customers of any national bank, both in the great centers and the "country banks," as all those outside of the centers are termed, have seldom been reminded that money in the market was in any sense out of the normal run. The business house is protected against whatever desire an ambitious official might have to give his bank the benefit of high rates of interest by the custom, now well established, of a flat rate of interest paid by customers, regardless of the market. Usually a customer carrying a line of paper with a bank agrees to a flat rate, say 5 per cent., which shall prevail regardless of the market. Sometimes the 5 per cent. is more than the market, but sometimes, as during the past weeks, it is below it. Six per cent. on time money has been commonly quoted. There are some borrowers who insist on the market rate when the market is down. It often happens, especially in smaller places, that those customers are not so popular with bank men as are those of the other class, and when the market goes up they must pay the prevailing rate, which is only fair. The average comes to perhaps 5 per cent. It is a little more troublesome than the flat rate and probably nothing is saved the borrower.

No speculation as to rates of interest can be profitable in a successful business house of ordinary size. Usually when a cash basis account cannot be established a line of paper is carried with a well defined upper limit. When the money is needed it cannot wait for the market to fall. It must be had. Generally it is planned for weeks ahead. In times such as these, with business rushing to full limits of capacity, the manufacturer usually needs more capital than when conditions are less prosperous. Though collections may now be better and money can be turned over oftener, still extra capital may mean more money earned, up to a limit, which should be set too low rather than too high. The business man who pays his flat rate on his notes knows what to expect. He need fear no higher rate. He does not have to study the money market, which is well, for usually he has his markets for materials to scan closely and intelligently, and his time is otherwise taken to the last minute of profitable energy. It is easy to imagine the confusion which would exist to-day were market quotations permitted to govern all commercial paper.

The Financial Position of Large Companies.

While the year 1904 was one of atonement for financial transgressions in the organization of large manufacturing companies, 1905 proved to be a period of buoyant recovery. Instead of running into a prolonged season of restricted business and unremunerative prices the depression ended in the autumn of 1904 and was succeeded by one of the greatest outbursts of business activity ever experienced. This has inured heavily to the advantage of the large corporations. In 1903 and 1904 their earnings declined so seriously that not only were dividends passed on common stocks but in conspicuous instances preferred dividends also suffered, and if the depression had not ended when it did even the United States Steel Corporation would have been obliged to cut or pass its preferred dividend. In fact, for one quarter the dividend was not earned but was paid out of the surplus. Other industrial corporations not only discontinued the payment of dividends but were forced to borrow money to tide over pressing obligations. The Republic Iron & Steel Company, which had been organized with no bonded indebtedness, mortgaged its property and issued bonds to the extent of \$10,000,000. The Crucible Steel Company of America not only sold its Clairton plant to the United States Steel Corporation for the purpose of freeing itself from what appeared to be a fatal incumbrance, but also authorized the issue of bonds up to \$5,000,000 if the management should find additional capital needed to stem the tide of adversity. The Lackawanna Steel Company was obliged to increase its bonded indebtedness far beyond what had been considered adequate for the completion of its new plant at Buffalo. At that time doubt and discouragement ruled everywhere, being strongly manifested on the stock exchanges, where prices of industrial stocks sank to a very low point.

The change since then in the financial condition of the large industrial corporations has been little short of marvelous. The heavy demand for iron and steel throughout 1905, which for the greater part of the year strained to the utmost the producing capacity of the country, so largely increased the earnings of these companies that many suspended dividends have been resumed. The Republic Iron & Steel Company has not only again begun to pay dividends on its preferred stock, but has also made some headway in paying off the accumulated dividends which accrued during the period of suspension. The Crucible Steel Company of America increased its earnings so heavily that not only was it found unnecessary to issue the bonds authorized, but, even more remarkable, the management felt it safe to begin to pay the preferred stockholders a portion of what was due them. The Tennessee Coal, Iron & Railroad Company resumed regular quarterly dividends on its common stock. The holders of the common stock of the Sloss-Sheffield Steel & Iron Company for the first time were given a return on their investment. The United States Cast Iron Pipe & Foundry Company not only increased the dividend on its preferred stock to the full rate authorized by its charter, but also most unexpectedly began to pay dividends on the common stock. Although the United States Steel Corporation has not resumed the payment of dividends on its common stock its earnings are increasing at such a rate as to give promise that the surplus will eventually attain the limit fixed by the management as desirable or necessary, after which dividends are looked for.

In this connection it is particularly worthy of note that the heavy earnings of the past year, which have brought about such gratifying improvement in the

finances of the large companies, were not the result of high prices such as have prevailed in previous periods of excited demand for iron and steel. Prices could undoubtedly have been advanced considerably above the rates ruling last year if manufacturers had been influenced solely by a disposition to take full advantage of temporary conditions. But the spirit of conservatism ruled, particularly in trade councils in which representatives of the large companies participated. The trade principle was recognized that while buyers under some stress will pay extravagant prices those not under such stress either limit their purchases or absolutely refrain from placing orders. Hence prices in 1905 were not permitted to advance to a point which checked consumption or discouraged enterprise. Profits were satisfactory but not excessive. The financial outcome of the year therefore demonstrated that running plants to full capacity, with moderate prices for products, produces most excellent results for stockholders.

The following table shows the course of prices during the year on most of the stocks to which reference has been made above:

	Opening.	Low.	High.	Last.
U. S. Steel, common.....	30%	24%	43%	43%
U. S. Steel, preferred.....	93%	90%	107	106%
Republic, common.....	17%	15	36%	34
Republic, preferred.....	71%	67	108	106%
Tennessee, common.....	71%	68	148	131%
Sloss-Sheffield, common.....	63%	60	118%	89%
U. S. Pipe, common.....	20	19%	48%	45%
U. S. Pipe, preferred.....	79%	79%	97%	94%

It will of course be remembered that the very high prices realized on the Tennessee and Sloss-Sheffield stocks were not simply because dividends were being paid on them but because of purchases for control when consolidation projects were pending. The advances in the other stocks were almost wholly based on improved earnings.

CORRESPONDENCE.

The Iron Ores of Georgia.

To the Editor: The report of the Swedish Parliament on the iron ores of the world attracted much attention, particularly in this country, since a summary of that report appeared in your journal. Much comment has been caused by the fact that only 60,000,000 tons were credited to Alabama. This seems to have referred to brown ores, while red ores appear to have been left out of calculation.

It is more remarkable, however, that even in the comment on this remarkable omission the leading authorities in this country have failed to notice the fact that no attention whatever was paid to iron ores in Georgia, where the brown ores far exceed the brown ores of Alabama in quantity and excel them in quality. These ores are located in Bartow, Floyd and Polk counties, which adjoin each other in the northwestern part of the State. This region has been the seat of an iron industry for 60 years. The first iron furnace of Georgia was located on Stamp Creek, 10 miles northeast of Cartersville, about 1840 by Moses Stroup. Not long afterward that property was acquired by Mark A. Cooper, a grandfather of the undersigned, who operated another furnace located on Etowah River, four miles from Cartersville, and also established a rolling mill in the same vicinity. These properties were seized and the improvements destroyed by the Federal Government in 1864. The most extensive ore banks in Georgia are known as the Sugar Hill ore mines, in Bartow County. They lie on the Iron Belt Railway a few miles north of Cartersville.

Georgia contains also vast deposits of red fossiliferous ores. A conservative estimate of these ores in Dade, Walker and Catoosa counties would be 1,000,000,000 tons. The deposits of the Georgia Iron & Coal Company alone have been estimated as high as 100,000,000 tons of red ore in Dade County and 50,000,000 tons of brown ore in Bartow County. This company is operating the only coke furnace in Georgia. It has a capacity of 225 tons a day and uses Bartow County ore.

Another important feature of Bartow County deposits is the manganese ore in the Sugar Hill district. These probably are the most important manganese ore deposits in the United States. Their value is likely to increase with the prolongation of the troubles in Russia, in which country the most reliable supply of manganese ore has been found in recent years. Russian industries have been paralyzed for the present and probably will be for some time to come by the state of anarchy in that country, and the demand for American ores of this type has suddenly become very strong. The immediate contiguity of manganese ore with iron ore of high quality in Georgia makes a remarkable combination, which is especially worthy of note at this particular time.

It seems proper in view of these facts that attention should be called to the oversight in what purports to be a complete report of the iron ore supply of the world. It is not a little strange that even in discussing such a manifest error as that made in the case of Alabama, where the entire red ore supply, amounting probably to more than 2,000,000,000 tons, was omitted, American authorities have overlooked an equally great blunder in omitting entirely the more valuable ores of Georgia.

W. G. COOPER,

Secretary Atlanta Chamber of Commerce.

ATLANTA, GA., December 27, 1905.

Progress in Electrical Work.

Thomas C. Martin, editor of the *Electrical World*, in a review of electrical progress in the *New York Herald*, says:

Production of electrical apparatus in the United States reached during 1905 a total of about \$200,000,000. This is allowing a rate of growth of about 10 per cent. The General Electric Company, one of the greatest manufacturers in the line, is said to have gained 40 per cent. in some departments over the preceding year. In fact, the demand for dynamos and motors has lately gone to enormous lengths. There is not a shop producing such apparatus that is not overtaxed and turning orders away if prompt delivery be a part of the contract. It would not be surprising to see the value of the dynamo and motor output reach from \$65,000,000 to \$75,000,000. It was about \$55,000,000 in 1904. Since that time the great orders from underground roads and trunk steam roads have begun to flood the limited channels of electrical production, and it hardly seems possible that the revolution on the steam lines can go on very long or go very far without calling forth new sources of supply of apparatus beyond those already existing and in command of the field at very profitable prices.

This abandonment of the steam locomotive for electricity is indeed one of the great economic, technical and social facts of the year, for it touches everybody. It is good alike for the railroads and for every passenger who travels on them.

The third week of December alone saw the opening of the first electrical section of the West Shore; the announcement that, throwing out all steam locomotives, the Pennsylvania Railroad is to equip its Atlantic City-Philadelphia line complete with a fast electric service; the proclamation of the Erie Railroad that it will begin at once an elaborate system of electrification; the statement that the Grand Trunk Railroad has awarded an electric contract for its Sarnia Tunnel, scene of so many steam tragedies, and the opening of the Philadelphia subway system, similar to the underground in New York.

What inference from such a bunch of tidings can any shrewd, observing man draw except that on the steam roads the electrical revolution is well begun and swiftly spreading?

A land craze has been a notable incident of the past few months in western Kansas and Nebraska. What was a year ago scarcely more than a quiet movement from East to West has become almost an exodus of certain classes of farmers, and with it has come an increase in land values that is said to be startling to old settlers. Lands have increased in value not alone in the wheat sections but far out in the grazing districts, where trainloads of settlers are locating.

The Pittsburgh Iron Trade in 1905.

BY ROBERT A. WALKER, PITTSBURGH, PA.

The year 1905, not only in the Pittsburgh iron trade, but in the trade of the entire country, was marked by a wonderful activity, which continued practically the entire year and developed during the last six months of the year to a volume without precedent. In spite of this there was a stability in prices with an entire absence of that runaway market which had been the experience of the iron trade before the formation of the United States Steel Corporation and other large consolidations. A marked feature of the year was the extraordinary buying on the part of the railroads of steel cars, steel rails and other railroad equipment. Orders poured into the mills with a rush that filled them up for months ahead, and while the rail mills have pretty well cleaned up the heavy tonnage placed for 1905 delivery the steel car and locomotive builders and other manufacturers of railroad equipment are still many months behind in deliveries.

Financial conditions throughout the year could not have been better, 1905 having been entirely free from failures that would have seriously affected the iron trade. Business confidence, that was so strongly lacking all through 1903 and the greater part of 1904, had been largely restored and the country was in sound condition in every way. For several years previous to 1905 the railroads had been unable to make satisfactory financial arrangements to purchase materials, but with the improved money conditions that came in the latter part of 1904 and early in 1905 the railroads were able to negotiate loans and float securities at rates that were satisfactory and gave them sufficient money to purchase the equipment they so badly needed.

There has probably never been a year in the iron trade in which the demand was so active as in 1905 that showed as small fluctuations in prices as during the year just closed. This was largely due to the fact that the large interests, such as the United States Steel Corporation, Jones & Laughlin Steel Company, Republic Iron & Steel Company, Cambria Steel Company, Lackawanna Steel Company and others that might be named, are pretty thoroughly in control of the whole finished iron trade and have the raising or lowering of prices so largely in their hands that violent fluctuations, such as we have had in past years, are practically impossible. It has always been contended by the managers of these large interests that it is not their intention to take advantage of customers during an active period and advance prices to an unreasonable high point. This policy has been closely followed out. They have repeatedly refused to agree to advances in prices that were insisted upon by other interests, in the belief that in the end they would probably prove detrimental to the trade. This condition has imparted confidence to large consumers, who now place contracts for long delivery with almost positive assurance that there will be a stable market and no undue fluctuation in prices either way.

New uses for steel are constantly being found. It is only six or seven years since the manufacture of steel cars on a commercial scale was started and yet in that short time this important industry has grown to such large proportions that it takes fully one-half of the entire product of steel plates made by the Carnegie Steel Company and other large mills. During the year 1905 the manufacture of steel railroad ties has engaged the attention of the larger interests and there are already on the market numerous designs. The scarcity and high prices of wooden ties have at last brought this country to the necessity of finding a suitable substitute for them. The Carnegie Steel Company is now making at its Homestead Works railroad ties on a commercial basis, and it is very evident that the business is destined to develop rapidly. For many other purposes steel is being applied to new uses and the next decade will witness a marvelous increase in consumption.

The year 1905 did not witness any large mergers in the iron and steel trades, but with a renewal of confi-

dence that has come in iron and steel securities, largely because of the enormous earnings of this year, it is not likely that 1906 will see some important consolidations.

New Construction.

In marked contrast with the year 1904 there has been an active revival in the building of new plants and some large enterprises were put under way in 1905, some of which will not be completed until well toward the close of 1906. The largest of these in the Pittsburgh and Valley districts is that of the Youngstown Sheet & Tube Company, at Youngstown, Ohio, which has had under way for some months the building of a large Bessemer steel plant. It is hoped to have these works ready by July 1, 1906. The plant will embrace a Bessemer shop, mills for rolling billets, sheet and tin bars and skelp and plate mills. It will have a capacity of close to 1500 tons per day and will call for the expenditure of about \$5,000,000. It will relieve to some extent at least the shortage in supply of billets, sheet and tin bars, which was so severely felt in the last four or five months of 1905.

The National Tube Company has gone steadily ahead with the building of its large new tube mills at Lorain, Ohio, and in the reconstruction of its National Works, at McKeesport, Pa. The Lorain plant is well along toward completion and has been making pipe for several months. When the work at Lorain and McKeesport has been completed the company will have a capacity for making upward of 10,000 tons per month of tubular goods.

The Carnegie Steel Company and the Jones & Laughlin Steel Company have made large extensions to their plants, which have very much increased their steel making capacity. The Carnegie Steel Company finished the building of a blast furnace at Bessemer which was started late in 1904 and is adding ten open hearth furnaces to its Homestead Works. Two new finishing mills have been built by the same company at its Clairton Works for the rolling of intermediate sizes of structural steel. The Jones & Laughlin Steel Company has completed the building of two more Talbot continuous open hearth steel furnaces and is now engaged in the erection of a new structural mill to roll intermediate sizes of shapes. This mill is being put up in record breaking time. Ground was broken in November and it is expected to be completed and in operation in January. It will have a capacity of 8000 to 10,000 tons a month. The Jones & Laughlin Steel Company is now one of the largest steel producers in the United States, ranking second to the United States Steel Corporation, with a daily capacity of more than 3000 tons. Other manufacturers in the Pittsburgh district made extensive additions and improvements to their plants and have steadily maintained the usual high physical condition of the mills of the district.

The La Belle Iron Works, Steubenville, Ohio, completed in September its new 84-inch plate mill, which makes this company one of the leading plate producers in the Central West, and also made other smaller additions to its plant. At Portsmouth, Ohio, the Portsmouth Steel Company completed during the year the installation of an 84-inch plate mill, built by Mackintosh, Hemphill & Co., and which gives this plant an output of about 5000 tons of plates per month. The company also made additions to its open hearth plant and to other departments and spent nearly \$400,000 during the year in betterment of its works.

The large engineering concerns in the Pittsburgh district, such as the United Engineering & Foundry Company, the Mesta Machine Company, Mackintosh, Hemphill & Co. and others, were filled up with work practically through the whole of 1905 and enter the new year with enough contracts on their books to insure full operation of their plants for some months. The Mesta Machine Company has materially enlarged its plant and is now one of the largest establishments in the country devoted

to the manufacture of engines and general rolling mill equipment.

In the New Castle district the Carnegie Steel Company made notable additions during the year to its South Works at South Sharon, Pa.; the North Works at Sharon, Pa., and to the Shenango Works, at New Castle, Pa.

Price Agreements.

The large steel interests have worked in harmony in making prices on such important products as rails, billets, plates, steel bars and structural material, and prices on these products were kept under control during the whole year. Conditions as to billets were such that the market took care of itself and the official price fixed by the leading mills has been disregarded for some months. That these price agreements among the large interests are beneficial alike to the producer and consumer have been demonstrated time and again. In a market such as that of the last half of 1905 there is no doubt that prices on such materials as structural steel, steel plates and steel bars could easily have been pushed up to the danger point or beyond it, and yet in spite of the enormous demand for these products only one advance in prices was made and this was fully justified by existing conditions. The benefits derived from these price agreements for some years seem to warrant the assertion that they are likely to be continued.

Labor Matters.

The year opened with labor fully employed and earnings higher in practically all trades than ever before. The Amalgamated Association, which is no longer a dominant factor in labor matters in the Pittsburgh district, held its annual convention in Detroit in May and suggested some radical changes in the new wage scale for sheet and tin plate mills for the scale year, to commence July 1. An advance was asked of about 18 per cent. in the sheet scale and of about 20 per cent. in the tin plate scale. In the subsequent conferences with the manufacturers, however, it was found that the advances asked for would not be entertained and the sheet and tin plate scales were signed on the same basis as before.

The principal labor trouble during the year, and which is still unsettled, was at the sheet and tin plate plant of the Whitaker-Glessner Company, Wheeling, W. Va. This company asked for certain concessions from the Amalgamated Association, which it refused to grant, with the result that the company closed its plant down, and it has since been idle. Several unsuccessful attempts were made during the latter part of the year to bring about a conference with the Amalgamated Association with the view to ending the lockout. The former employees in the plant are becoming very much dissatisfied over their long idleness, and some of them have moved from the Wheeling district and obtained employment elsewhere. Others would be glad to go back to work if allowed to do so by the Amalgamated Association. That organization has lost much of its former prestige and is not in any position to enter a struggle, its finances being low and its membership very much decreased. For these reasons it is very probable that when the time comes in 1906 to make up the new wage scales for puddling and bar mills, sheet and tin plate mills, there will be very little trouble in arriving at a settlement.

There are only three manufacturers of iron bars in the Pittsburgh district at the present time, these being the Lockhart Iron & Steel Company, Brown & Co., Incorporated, and Zug & Co., Limited. All of these operate their mills on a union basis and sign the Amalgamated scale. The large steel interests have not recognized organized labor for many years. Most of the sheet and tin plate mills in the Pittsburgh district owned by the American Sheet & Tin Plate Company are operated non-union, and the same is true of some of the independent mills.

The close of 1905 found labor unusually well employed and at high wages, and it can be truthfully said that any man who is out of employment is idle because of his own desire and not because he can not find work.

Foreign Trade.

The domestic demand for iron and steel products was so active during nearly all of 1905 that practically none

of the large steel manufacturers, aside from the United States Steel Corporation, made any attempt to cultivate foreign trade. The corporation has maintained for several years an identified interest known as the United States Steel Products Export Company, which looks after its export business. This company has been active in foreign markets and has secured some very large contracts for steel rails, plates, sheet and tin bars for export. It is the policy of the corporation to maintain its foreign trade relations, even during times when the domestic demand is heavy, having in view the lean years to come when its foreign trade will take its surplus product.

In the review of the iron trade one year ago, speaking of the outlook for 1905, the writer said: "Every confidence is felt that the new year is going to be one of the best years the iron trade has ever witnessed." How well this prediction has been borne out is now a matter of history, and the same statement could be very aptly made with regard to the outlook for 1906. In fact conditions at present are really more favorable than they were at the close of 1904.

The year 1905 closes with stocks of pig iron reduced to a minimum in spite of the fact that the country is making metal at the rate of more than 2,000,000 tons a month.

The United States Steel Corporation, through its affiliated interests, has closed the year with orders on its books for more than 7,000,000 tons of material, or practically seven months' run for its various works, putting its output at the rate of 1,000,000 tons a month. Other large steel interests are well sold up. The railroads were enormous purchasers of equipment in the last six months of 1905, and we will be well along in the new year before these orders have been filled, even if no more should be placed, which is very improbable.

In the last two or three months of 1905 the demand for sheets and tin plate, wire products and pipe was unusually active, partly due to the favorable weather which permitted building operations to be carried on without interruption. This resulted in a very large increase in the consumption of these products, while in plates, structural steel, steel rails and steel bars the mills are sold up for practically the first six months of the new year. Predictions are made that before the year 1906 has closed this country will be making pig iron at the rate of 30,000,000 tons a year and that the new uses for iron and steel will readily absorb this enormous tonnage.

While it is possible that some early advances in prices may be made on sheets, tin plate and wire products, which are comparatively low, based on the cost of steel, it will be the policy of the large interests to maintain the whole market as nearly as possible on the present basis, as it is recognized that conservative prices are more apt to result in heavy demand than if they are advanced to an unusually high point.

Pig Iron.

The year 1905 in the pig iron trade was one of unusual activity and some enormous records for production were made. No new blast furnaces were built in the Pittsburgh district proper during 1905, but there is every probability that at least two new blast furnaces and perhaps five will be built during 1906. The Carnegie Steel Company has asked an appropriation from the United States Steel Corporation for the building of two adjacent to the present Duquesne furnaces and three beside the present Carrie furnaces at Rankin. It is certain that at least two of the Carrie furnaces will be built. These stacks will be about 20 x 90 feet in size and will be equipped with the Gayley dry blast system. Each stack will have a daily capacity of about 600 tons. Should the entire five be built it means an increase of very close to 1,000,000 tons a year of pig iron in the Pittsburgh district alone.

At present there are 43 blast furnaces in Pittsburgh, of which the Carnegie Steel Company operates 30, the American Steel & Wire Company 4, the Jones & Laughlin Steel Company 6, the National Tube Company 2 and the Clinton Iron & Steel Company 1. These furnaces have a total weekly capacity of 112,000 tons, which is about 25 per cent. of the entire output of the country. At the close of 1905 all of the furnaces in the Pittsburgh district were

In operation with the exception of one Isabella and one Duquesne, laid off for repairs and to allow the Gayley dry blast system to be installed. The Jones & Laughlin Steel Company has had under consideration for some time the building of one or two more blast furnaces and may do something in this direction during 1906, as it has so materially increased its steel capacity that a larger pig iron supply is badly needed.

Bessemer Pig.

The year opened with a strong demand, Bessemer and basic iron selling at about \$16, Valley furnace, or \$16.85, Pittsburgh. The market ruled at \$15.75 to \$16 until about March 15, when the Bessemer Pig Iron Association and other leading producers were quoting \$15.50, while this was being shaded from 25 to 50 cents a ton by the smaller dealers. About March 20 the Cambria Steel Company bought 45,000 tons of Bessemer and basic, divided among the Bessemer Pig Iron Association, La Belle Iron Works and W. P. Snyder & Co. The Youngstown Sheet & Tube Company also bought 25,000 tons of Bessemer iron from the Bessemer Pig Iron Association at \$15.50, Valley furnace, for delivery over the last six months of the year. These large sales naturally had the effect of strengthening the market, and on April 1 the large producers were quoting \$16, Valley furnace. The market quieted down to some extent in April, Bessemer going as low as \$15.50, Valley furnace. On May 1 blast furnace labor in the Mahoning and Shenango Valleys was advanced 10 per cent, adding about 10 cents a ton to the cost of making iron. The price of \$15.50 for Bessemer and basic continued all through April, but in the latter part of May there was a decided softening in the market and in the first week in June, while \$15 was being quoted, sales were made at \$14.75 or less. By June 15 Bessemer and basic had gone down to \$14.50, Valley furnace, and was rather weak. Sales for the month were very light. In the first week in July Bessemer sold as low as \$14, Valley furnace, and several sales of basic were made at \$13.75. The market continued very dull through June and July and prices were rather weak. Early in August there was some talk of the United States Steel Corporation coming in the market for upward of 50,000 tons and this had the effect of strengthening prices. In the first week in September the corporation made its initial fall purchase of 25,000 tons of Bessemer iron, for a large part of which it paid \$14.50 and for the balance \$15, Valley furnace. At this time it was operating 92½ per cent of its total blast furnace capacity, but could not supply its steel plants with the metal required. On September 16 the corporation bought 10,000 tons more of Bessemer iron at \$15, Valley furnace, and the Cambria Steel Company bought upwards of 50,000 tons of Bessemer and basic from W. P. Snyder & Co., covering its requirements from October to January. The minimum price of Bessemer and basic iron was established at \$15, Valley furnace, and the market became extremely active. About October 15 the Steel Corporation bought 40,000 tons of Bessemer iron for October and November delivery, paying \$15.50 for the October iron and \$16 for the November iron. At this time a small sized boom had developed in the pig iron trade and other large consumers besides the corporation were buying actively and prices moved up rapidly. About November 1 Bessemer and basic iron were firm at \$16.50, Valley furnace, or \$17.35, Pittsburgh, some sellers quoting as high as \$17 at furnace. Early in December the Midvale Steel Company bought upward of 6500 tons of Bessemer iron at \$17 to \$17.25, Valley furnace, and by December 15 the market was extremely firm on the basis of \$17.50 for Bessemer and about \$17.25 for basic. The lowest price reached during the year on Bessemer iron was about \$14 at Valley furnace, this price ruling in July and August, and the highest price was \$17.50 at furnace, which was quoted at the close of the year.

Foundry Iron.

The general demand for foundry iron was much heavier in 1905 than in 1904, due to the great activity in the foundry trade. The year opened with No. 2 foundry selling at \$16.25 to \$16.50 at Valley furnace, or \$17.10 to

\$17.35 Pittsburgh. In February prices had declined about 50 cents a ton, No. 2 being held at about \$16. The demand in February, March and April was fairly heavy and about March 1 the Wheeling Mold & Foundry Company made heavy purchases of Nos. 2 and 3 foundry for its contracts for castings for the North River Tunnel, New York. In May and June the demand was dull and No. 2 foundry had declined to \$15.50 at Valley furnace and was weak at that price. At this time the large foundries in the Pittsburgh district, such as Westinghouse, Mesta, United Engineering, Standard Sanitary, Mackintosh-Hemphill and others, were exceedingly busy and the consumption of foundry iron was very large. Prices, however, continued to weaken and in the first week in July No. 2 foundry had declined to \$14.25 and \$14.50, Valley furnace.

In August Southern makers of foundry iron were firm in their quotations on prices and this had the effect of strengthening prices on Northern iron. In September the stronger tone of the market had developed into an actual advance, No. 2 selling in the latter part of that month at \$15, Valley furnace, with some sellers quoting higher. In September some very heavy purchases of foundry iron were made by the Standard Sanitary Mfg. Company, Westinghouse Air Brake Company and other large consumers. The market continued to improve for the balance of the year and at the close of December No. 2 iron was held at about \$17.50, Valley furnace. A large tonnage of iron was sold in the last quarter of the year for delivery through the first half and in some cases all through 1906 and at good prices.

Gray Forge Iron.

The consumption of gray forge iron in 1905 was much larger than in the preceding year, due to the greater activity among the rolling mills which are the leading consumers. The year opened with forge iron selling at about \$15, Valley furnace, or \$15.85, Pittsburgh. However, in sympathy with Bessemer and foundry iron, gray forge declined during the first half of the year and in the first week of July it was nominally \$13.50, Valley furnace. The market ruled at about this price until September, when it commenced to improve, and in the first week of October gray forge was held at about \$14.25, Valley furnace and the demand was quite active. In the first week in November Valley furnaces were quoting \$15.50 at furnace, and some heavy sales were made in the early part of the month. The year closed with gray forge ruling at about \$16, Valley furnace, with some sellers asking higher prices.

Steel Rails.

No change was made during 1905 in price of standard sections and the price of \$28 at mill has been reaffirmed for 1906 deliveries. The rail trade in 1905 was very much more active than in 1904 and for the new year promises to be very much larger than in the two preceding years. The tonnage booked by the mills up to the close of December for 1906 delivery approximated 2,000,000 tons, with many leading railroads yet to cover for their requirements. The Illinois Steel Company is understood to be practically sold up for 1906 on rails, and the Carnegie Steel Company is filled up for the first six months of the year or longer.

During 1905 the Republic Iron & Steel Company completed the building of its new rail mill at Youngstown, rolling its first rail June 1. This mill, however, has run only intermittently on rails, the company having found it necessary to go on billets and sheet bars in order to fill pressing contracts. The Carnegie Steel Company completed the building of its No. 3 rail mill at the Edgar Thomson Works and some enormous records for output were made at this plant during 1905. The largest record for any one month was in October, when the Edgar Thomson mill rolled over 83,000 tons, a record for one month that is likely to stand for a long time.

Steel Billets.

While there is still an informal agreement among the billet mills it cut practically no figure in the actual market during 1905, the enormous demand for steel that existed through the whole year making the official prices inoperative. The year opened with Bessemer and open

hearth billets selling at about \$22 and sheet and tin bars at \$24, maker's mill. At this time the official price on billets was \$19 and on sheet and tin bars \$21. The mills were full of tonnage and the market continued very firm. By the middle of February the mills were behind in deliveries and Bessemer and open hearth billets were commanding as high as \$24 and sheet and tin bars \$26, for prompt shipment.

Early in March came the announcement that the Youngstown Sheet & Tube Company had decided to build a large Bessemer plant at Youngstown, for the rolling of billets, sheet and tin bars, and the information was very gratifying to the outside sheet and tin plate mills that were not getting prompt deliveries on bars. In the first week in May Bessemer and open hearth billets were very strong at \$24 and sheet and tin bars were \$26, maker's mill. At this time there was a lull in the general iron trade and prices of steel softened to some extent. This was emphasized in June, when Bessemer and open hearth billets were weak at \$22 and sheet and tin bars had declined to \$24. This weakness in prices was largely due to the shut down of the sheet and tin plate mills on account of labor matters, but the Amalgamated scales were quickly arranged and the usual summer shut down was of very brief duration.

By the middle of July Bessemer and open hearth billets had again advanced and the demand was very active, Bessemer and open hearth billets selling at \$23 and sheet and tin bars \$24. Early in September steel became scarce, Bessemer and open hearth billets readily bringing \$25 and sheet and tin bars \$26. The steel situation continued exceedingly strong up to the close of the year and in the last week in December Bessemer and open hearth billets were held at \$26 to \$27 and sheet and tin bars \$27 for random lengths, maker's mill.

The scarcity of steel in the last half of the year very strongly emphasized the fact that an actual shortage exists in producing capacity, especially in open hearth steel, and it is not unlikely that during 1906 steps will be taken by the leading steel producers to remedy this shortage. There were times during the last three or four months of the year when it was almost impossible to get open hearth billets at any price, while deliveries on sheet and tin bars were very irregular and unsatisfactory to consumers.

Undoubtedly the chief event in the billet trade during the year was the contract made the last week in June between the Pittsburgh Steel Company and the Carnegie Steel Company, by which the latter interest furnishes to the former 200,000 tons of Bessemer and open hearth billets a year for five years, dating from July 1. This was the largest individual contract ever made in the steel billet trade, and has proved very satisfactory to both buyer and seller. The contract is on a sliding scale basis, the price of billets for each month's delivery being based on the average selling price of Bessemer pig iron, f.o.b. Pittsburgh. Prior to making this contract the Pittsburgh Steel Company had plans made for the building of blast furnaces and an open hearth steel plant at Monessen, but with the closing of the contract these plans were given up.

Connellsville Coke.

In sympathy with the pig iron market the demand for both furnace and foundry coke was exceedingly active during practically the whole year, and when the records for output of coke in the Upper and Lower Connellsville regions for 1905 have been made up it will be found that these two regions turned out in 1905 over 16,000,000 tons of coke, exceeding the best year's previous record by nearly 3,000,000 tons.

When the year opened, Connellsville furnace coke was selling at \$2.10 a ton and 72-hour foundry at \$2.25 a ton, at oven. Before January had expired coke for prompt shipment was very scarce, furnace coke bringing \$2.75 and foundry \$3 a ton, these high prices being due to the shortage of cars and an inadequate water supply. By the middle of February these troubles had largely disappeared and furnace coke was freely offered at \$2.50 and foundry at \$2.75 a ton. In the latter part of February the Lackawanna Steel Company made large

purchases of coke for its furnace plant at Buffalo, N. Y. At this time reports were current that the H. C. Frick Coke Company had bought out the Hecla Coke Company, but this was officially denied.

Early in April prices on furnace coke had improved to \$2.40 a ton, and 72-hour foundry was selling at about \$3 a ton. Before April expired the plentiful supply of cars and the enormous quantity of coke being turned out had commenced to tell on prices. In the latter part of that month strictly Connellsville furnace coke was offered for prompt shipment as low as \$1.90, while outside brands of furnace coke were selling as low as \$1.50. The demand at this time was very dull, and, in fact, this was the worst period in 1905 in the coke trade. In the latter part of May the output showed a large falling off and prices were rather weak. Before June had expired conditions were slightly better as regards demand, but prices were lower, Connellsville furnace coke selling at \$1.75 a ton or less. In the first six months of 1905 the output of coke in the Upper and Lower Connellsville regions exceeded 9,000,000 tons, establishing a new six months' record.

Before July had expired prices commenced to improve and steadily grew better for the balance of the year. Early in September Connellsville furnace coke was selling as high as \$2.40 and foundry at \$2.50 to \$2.75. In October and November furnace coke sold up to \$2.75 and \$3. In October announcement was made that the Pennsylvania Steel Company had bought the entire output of the Mount Pleasant Coke Company for the first half of 1906. The demand for furnace and foundry coke in November was enormously heavy and prompt coke was very hard to get. In December the supply improved, owing to plenty of cars and favorable weather, and prices of furnace coke for prompt shipment declined to about \$2.75, this price ruling at the close of the year.

It can be definitely stated that the year 1905, from the standpoint of output and profits, was undoubtedly the best year the coke makers have ever had and the outlook for 1906 is equally promising. During 1905 a very large number of new ovens were built in the Connellsville region and if the pig iron and foundry trades continue active during 1906 there is every reason to believe that the Upper and Lower Connellsville regions will turn out very close to 18,000,000 tons.

Finished Iron and Steel.

The year 1905 in the finished iron and steel trades was one of wonderful activity and was marked by new records for output. Owing to the control of the market held by the large interests prices were stable during the entire year, and there was almost an utter absence of fluctuations, which had characterized the trade in previous years.

The year opened with steel plates selling at 1.40 cents at mill for the medium widths and 1.50 cents for the wider sizes. On February 14 prices were advanced \$2 a ton, making narrow plates 1.50 cents and the wider sizes 1.60 cents. In September it was decided to remove the differential on the narrow sizes and all plates 6¼ inches and wider were put on the basis of 1.60 cents, Pittsburgh, for tank plate ¼ inch and heavier. The demand for plates practically through the whole year was exceedingly heavy and at the close of the year the large interests, like the Carnegie Steel Company, Jones & Laughlin Steel Company and others were filled up with tonnage for some months. The great activity in the steel car-building and lake ore shipbuilding trades, particularly in the last half of the year, was largely responsible for the enormous demand for plates.

The year began with structural steel in good demand, beams up to 15 inches selling at 1.50 cents at mill, with the usual differentials for the larger sizes. Two advances in prices were made during the year, of \$2 a ton each, one on February 14 and the other on September 1, the latter advance putting the price of beams and channels up to 15 inches at 1.70 cents, Pittsburgh, these prices being in force at the close of the year. The structural steel mills were filled up with tonnage through the whole year and in December the American Bridge Company had orders on its books for very close to 500,000 tons of structural steel. The total capacity of the works of this company is about 51,000 tons a month, so that it had on its books orders for ten months' work.

At the beginning of the year steel bars were selling at 1.40 cents at mill and the demand was quite active. In the summer months only a moderate amount of new tonnage was being placed, but in the last six months of the year very heavy orders were entered by the carbuilding interests and other consumers, and the year closed with an enormous tonnage of steel bars on the books of the mills, sufficient to take their output for the first three or four months of the new year. There was only one advance in steel bars during 1905 and this was made on March 1, putting the price to 1.50 cents at mill.

The merchant pipe trade in 1905 was fairly satisfactory as regards tonnage, but prices, especially in the latter part of the year, were uniformly low. At the opening of 1905 the demand was quite active and the mills had a large amount of tonnage on their books. On January 2, February 1, March 1 and April 20 the National Tube Company made successive advances of one-half point, or about \$2 a ton each in merchant pipe, but these advances were not maintained by the mills, and there was more or less unevenness in prices during the entire year. In July, August and September merchant sizes of pipe were selling at 80 and in some cases 81 per cent. off the general list, and under date of October 2 the company issued a new list of discounts, quoting merchant sizes of pipe at 79 off to consumers and 80 per cent. off to jobbers. These prices continued in force until the close of the year. The tin plate trade in 1905, especially in the early part of the year and in the last two months of the year was quite heavy, but there was a period dating from May to September when the demand was dull. In other lines of finished material, such as merchant steel, railroad spikes, boiler tubes and other products, the demand through the entire year was uniformly good, with the exception of two or three months in the summer when there was a slight lull. The outlook for 1906 in the finished iron and steel trades could hardly be better, all indications pointing to the heaviest tonnage in the new year that we have ever had. It is not believed that prices will be much higher than they are now, except possibly in sheets, tin plate and pipe, which are regarded as being unusually low in view of the high prices ruling in raw materials.

The Old Year and the New in Canada.

TORONTO, December 30, 1905.—In 1905 Canada enjoyed a prosperity such as it never before experienced. Not only had the manufacturing industries in the earlier part of 1905 the backing of large earnings by the farmers, miners and lumbermen in 1904, but they had also the home market more dependent on them than it had ever been before. This was due to two things—first, the continued prosperity which enabled the United States to keep its own manufacturers busy, and secured the increased protection provided by the Dominion Government. It is true that United States manufacturers were not so engrossed in the turning out product for domestic use as not to be able to give attention to this market. They sold more goods here in 1905 than they ever did before. But relatively to the total consumption of Canada their sales here in 1905 were not as great as in 1904, when their absolute value was less. In other words, the American imports into Canada left more room for Canadian goods than imports from the same quarter in 1904 left. Also, the profits on the manufactured output of Canada were larger than before, for there was less sacrificing of American goods here. Good times in the United States diminished the motives for sacrificing, and the Canadian antidumping duty put a check upon the importation of bargain lines.

Crops of 1905.

An unprecedented impetus was given to trade by Canada's last harvest. Both in quantity and quality the wheat yield surpassed that of any other year in the country's history. The Northwest and Ontario together produced 108,000,000 bushels of wheat. It is estimated that the value of the grain that Manitoba, Saskatchewan and Alberta will have to sell, after providing for food and seed, will amount to \$75,000,000. That this buying power is not being held in reserve is shown by the tremendous grain movement since threshing began.

The farmers of the West have been speculating in land considerably during the last few years and their debts were allowed to accumulate. The liabilities incurred for purchases last year and the year before from local merchants, from manufacturers of farming machinery, &c., are now being paid off, for the banks pressed the wholesalers and manufacturers, who passed on the pressure to the retailers, who were thus forced to collect from the farmers. But over and above the amount required to clear off old scores the Western farmers have a good surplus to spend on new account. New settlers keep moving into the country from the United States, Great Britain and Europe, all bringing with them the means to add to the agricultural production of the West. For these reasons it seems certain that the capacity of the consumptive demand of the prairie country in 1906 will very greatly exceed that of 1905.

Railroad Construction.

Large as were the additions made to the country's railroad mileage in 1905, they will be surpassed by those made in 1906. Within the next two months the Grand Trunk Pacific will put under contract the line between Touchroad Hills and Edmonton, 775 miles in length. The Lake Superior branch, extending 205 miles from Fort William to a point on the main line, is to be rushed to completion before the close of 1906. To connect it with the main line west of Winnipeg 500 miles of main line from Winnipeg eastward will have to be built. This is in the Government's half of the main line, what is known as the Eastern Division. It is announced that the Government commission, which has charge of the Eastern Division, has now completed its surveys, not only from Winnipeg to the point of junction with the Lake Superior branch, but all the way to Quebec. Contracts to build eastward from Winnipeg and westward from Quebec will, according to advices from Ottawa, be let in a few weeks.

The Canadian Northern has now its road built as far west as Edmonton. It has a large programme of branch extensions for 1906. One branch to be begun in the spring and to be carried 90 miles northward before the end of the year is to be finally extended to Hudson Bay.

The Canadian Pacific will complete the doubling of its track, as far as possible, between Fort William and Winnipeg. Its enterprise in branch building has been stimulated by the example of the Canadian Northern, which over a large area is within competitive range. Both roads have been more active in spreading their respective spheres of influence since the route of the Western Division of the Grand Trunk Pacific was laid in such close proximity to them. The next year promises to be the busiest Canada ever had in the way of railroad building. The railroad builders will put a strain on the domestic rail manufacturers' capacity to which the latter may not be equal. So far, the Grand Trunk has been able to use all the rails the Dominion Iron & Steel Company has turned out, and has contracts which are likely to keep the latter busy during March, April and May. The International and the Canadian Pacific have taken a very large part of the Algoma Steel Company's output. If old lines can keep up so strong a demand, new capacity will be required to supply rails for the new mileage that will be constructed in 1906, or rails will have to be imported on a large scale. The two rail mills of Canada can hardly be depended on to produce more than 600 tons per day on the average. Both mills have orders that will keep them busy for a great part of the year.

Possibly existing steel companies will find it to their advantage to enlarge their plants and prepare to supply all the rails required. The duty should be a sufficient inducement. But the duty may be modified in the session of Parliament that is to open in a few weeks, for the chief business of that session will be tariff revision. It is certain that the railroad people will endeavor to have the burden of the present duty lightened. So far there is no talk of adding to the capacity of the plants except in the case of the Algoma Steel Company. It is reported to be contemplating the erection of an open hearth steel furnace to bring the Helen ore into utility for rail making purposes.

C. A. C. J.

The Chicago Iron Trade in 1905.

BY A. O. BACKERT, CHICAGO.

The upward movement of iron and steel values, which accompanied the wave of prosperity that set in early in the year and which is now nearly at its height, while of primary importance to manufacturers and consumers alike, assumes a place of secondary consideration as compared with the economic changes in the Western iron and steel trade foreshadowed in the year's developments. The Chicago district, occupying a position of first importance as a distributing and consuming center, depends largely upon other producing centers for its supply of raw and finished materials, notwithstanding its large productive capacity, which is second only to that of the Pittsburgh district.

Projected Increase in Producing Capacity.

Projected additions to furnace and steel works capacity, together with those undertaken and completed during the year, provide for an increased output of iron and steel in this district of practically 70 per cent. A part of these additions will provide for the natural consumptive increment, which is greater in the West and Northwest than any other section of the country, but the remainder will go a long way toward bridging the gap now existing between consumptive demand and productive capacity. Steel works furnaces with an estimated capacity of 1,500,000 tons annually are projected and under way, representing an increase over existing capacity of 75 per cent., and the three merchant stacks in course of erection will have a combined output of 280,000 tons, an increase over the present of 80 per cent. Steel works' extensions are confined to open hearth operations entirely, and plants with a total capacity of 1,500,000 tons annually were completed, undertaken and are projected, representing an increase in the total steel producing capacity of this district of 60 per cent.

This territory, offering an almost unlimited scrap supply, the market value of which is several dollars a ton lower than prices prevailing in other iron and steel centers, offers great inducements for the extension of open hearth operations, and that these advantages were only recently grasped is indicated by the predominance of the Bessemer steel output, which was 82 per cent. of the total production in this district one year ago.

The projected plant of the Illinois Steel Company, a site for which has already been purchased on the shores of Lake Michigan, near Buffington, Ind., aggregating 2500 acres, is the most important undertaking of the year. Although the plans have not been definitely decided upon, preliminaries provide for six blast furnaces with an approximate output of 1,500,000 tons annually; 30 50-ton open hearth furnaces with a capacity of 1,000,000 tons, and bloom, billet, rail and merchant mills. By the erection of this plant and additions to the existing plants at South Chicago, Joliet and Milwaukee, the Illinois Steel Company hopes to centralize its operations at these four works, and the ultimate intention is to dismantle the Union and North blast furnace plants in Chicago, which are by no means modern, and whose product is used at the South Works, entailing heavy shipping charges.

A noteworthy increase in merchant furnace capacity will result from the erection of the three stacks now under way, which will have a combined output of 280,000 tons, an increase of 80 per cent. over the existing capacity. Lake Superior, Ohio and Southern furnaces are now largely depended upon by Western foundries for their requirements, and the operation of these furnaces will materially reduce shipments of outside iron into this market. Furthermore, the Illinois Steel Company ceased to be a factor in the foundry iron market early in the year, having been the only constituent of the United States Steel Corporation that continued to sell iron for outside consumption after the organization of the corporation. The International Harvester Company is also figuring less and less as a seller of iron, requiring practically the entire output of its two furnaces for its steel plant and foundries.

The Year's Buying Movement Never Before Equalled.

The general revival of business which followed the presidential election of 1904 was the first ripple of the wave of prosperity now passing over the country. The heavy contracts for all classes of iron and steel commodities placed with the mills and furnaces during the close of that year permitted the manufacturers to enter the new year with large tonnages on their books. The impetus thus given the iron and steel trade, coupled with the large orders for rails and rolling stock placed by the railroads during the early months of the year, carried the market safely over the leaner summer period. During the latter part of August, when it became apparent that a record crop would be harvested, a buying movement set in which in volume of tonnage and duration was never before equalled. Consumption increased at a tremendous rate and with all the available producing capacity in operation the output of the mills and furnaces was insufficient to the demand. Pig iron values were moved up rapidly and an incipient boom was on. To prevent a repetition of the depressing effects that follow in the wake of a runaway market, powerful influences in the steel trade successfully resisted all efforts to boom prices and the few minor advances that went into effect leave values generally on a conservative basis and are favorable to the continuation of a record consumption. The necessity for an increased steel production in this district is indicated by the heavy orders placed for rails during the year with the Illinois Steel Company, aggregating 1,500,000 tons, the bulk of which was placed for rolling in 1906, and owing to the limited capacity of this rail mill specifications for upwards of 400,000 tons were transferred to the Carnegie mills at Pittsburgh.

The comparative freedom from labor troubles was particularly favorable to building operations and permits for structures costing \$62,500,000 were issued in Chicago alone. Price changes on finished commodities in extreme cases represent an advance of \$6 a ton and fluctuations in pig iron values show a spread of only \$3 a ton below the low point of the year.

The outlook for 1906, as considered from the tonnage carried on the books of the mills, is particularly bright and promises a year of great prosperity. Railroad requirements of rails and rolling stock for extensions and replacements are at a rate never before attained. The Illinois Steel Company entered the new year with rail orders aggregating 700,000 tons and plate requirements for lake boats and steel cars exceed the capacity of Western mills. The consumption of bars and light shapes on account of the heavy output of vehicle and implement plants will continue at the present rate at least through the first half of the year. The magnitude of building operations already projected forecasts a new high record, providing there is no interference from labor.

New Construction.

Additions to the iron and steel producing capacity completed and undertaken during the year were on a gigantic scale. Independent manufacturers as well as the Illinois Steel Company made heavy expenditures to provide for increased output. The principal operations of the latter were largely confined to additions at its South Chicago works and included:

	Annual capacity. Gross tons.
28-inch structural mill.....	150,000
40-inch blooming mill.....	200,000
Seven 50-ton open hearth furnaces.....	250,000
In course of erection:	
Blast furnace, 22 x 90 feet.....	180,000
Seven 50-ton open hearth furnaces.....	250,000

Other improvements of minor importance included additions to the finishing capacity of the rail mill by which the output has been increased 60,000 tons a year; extensions of the Hoover & Mason type of ore handling equipment to the dock on the north channel and an entirely new ore handling installation on the south dock. New

tops were placed on several of the blast furnaces and the equipment was generally improved and modernized. A fourth furnace is to be added to the group of three at Joliet. This stack will have an output of approximately 180,000 tons a year and will replace old furnace No. 3, dismantled some time ago. Additional machines were placed in the spike and bolt departments of this plant to meet the constantly increasing demand for track materials. At Milwaukee extensive additions are under way in the merchant bar departments and the output of several of the mills is being increased by the installation of labor-saving machinery. Blast furnace No. 1 at the North Works, Chicago, which was heretofore used as an alternate stack, has just been blown in to meet the increased steel works requirements of pig metal. The blowing capacity at this plant was increased by the installation of a blowing engine which was discarded at Joliet.

The additions to the merchant furnace capacity undertaken during the year include the following stacks now in course of erection:

Federal Furnace, South Chicago, for the Federal Furnace Company, Chicago, 18½ x 75 feet. Product, malleable and foundry iron. Annual capacity, 100,000 tons.

Third stack Iroquois Iron Company, South Chicago. Product, malleable and foundry iron. Annual capacity, 100,000 tons.

Mayville Furnace B, Mayville, Wis., for the Northwestern Iron Company, Milwaukee, Wis., 17 x 77 feet. Product, foundry iron. Annual capacity, 80,000 tons.

Additions to independent steel works and finishing mills were only of minor importance and included the installation of a merchant mill for rolling angles up to 4 x 4 inches by the Interstate Iron & Steel Company and the reconstruction of another mill, while the Inland Steel Company is increasing the output of its steel mill 30,000 tons a year by the installation of another 50-ton open hearth furnace. The Republic Iron & Steel Company, on the other hand, in carrying out its policy of centralizing its plants, has further curtailed its Western operations by abandoning and dismantling six Indiana mills. The list includes Central Works, at Brazil; Muncie, at Muncie; Terre Haute and Wabash, at Terre Haute; Alexandria, at Alexandria, and Westerman, at Marion. The combination rail and sheet bar mill which this company erected at Youngstown, Ohio, was placed in operation during the summer on rails and after rolling approximately 20,000 tons went on sheet bars. By the installation of this mill it was believed that the Republic Iron & Steel Company would become an important factor in the Western rail trade, but inasmuch as no orders have been booked for 1906 delivery it is altogether probable that the mill will remain idle the entire year, unless it is decided to take on business for prompt shipment that may be offered at premiums on account of the congestion at the other mills.

Building Operations.

Building operations at all Western centers equaled the boom periods in the early 90's and permits for 47 miles of structures costing \$62,500,000 were issued in Chicago alone. This represents an increase over the preceding year of nearly \$18,000,000 and was nearly twice the record of 1903, when labor troubles more than financial embarrassments interfered with construction work. Building strikes though numerous were of short duration, due to the firmness of employers rather than the conciliatory attitude of labor. The consumption of plates and shapes in large operations was approximately 75,000 tons, but was confined largely to requirements for buildings erected in the central business district, although the South Side Elevated addition made up a large portion of the total, with approximately 25,000 tons.

The erection of industrial plants was not as great, however, as in former years, manufacturers preferring to locate outside of Chicago, partly on account of the prevalence of labor troubles and further to secure such inducements as are offered in the way of cheap land, with ample provisions for future extensions. The plant of the Western Electric Company in the Hawthorne Division, which has been under erection for nearly three years and is now nearing completion, is the largest industrial undertaking within the confines of Chicago in recent years. In territory contiguous to Chicago the leading industrial operations undertaken or completed during the year include

the new plant of the Morden Frog & Crossing Works at Chicago Heights; Chalmers & Williams' new plant at Chicago Heights; \$3,000,000 extension to the plant of the Allis-Chalmers Company, Milwaukee; additions to the plant of the Illinois Steel Company; By-Product Coke Corporation at South Chicago, and 80 additional ovens to the Milwaukee Solvay Company's plant.

Labor.

As compared with former years the last 12 months have been comparatively free from labor troubles affecting the iron and steel trades. The machinists' contention was carried well through the year with little or no embarrassment to the employers, members of the Chicago Metal Trades Association. This strike, which was declared early in the summer of 1904, and which was waged fiercely by both sides for several months, was soon broken, but was not officially declared off by the International Association of Machinists until a few months ago. The open shop principle, which has prevailed in Chicago machine shops for nearly a year, was then officially recognized by the union and many employers have since closed their plants to union labor entirely.

A strike of the structural iron workers affecting the American Bridge Company alone, and which has only been on a short time, did not interfere with building operations to a great extent, nor has it extended to other contractors. The teamsters' strike for a time threatened a complete tie-up of the jobbing and retail trade, but a timely settlement prevented its spread.

Pig Iron.

Iron values for the year show an average increase over the 12 months preceding of \$3 a ton, notwithstanding the decline during the summer months. Heavy buying at the close of 1904 resulted in sharp advances and this basis was well maintained through the spring months. Large stocks at merchant furnaces, especially in the South and in the Lake Superior region, acted as counteracting influences, however, and with the falling off in demand in May prices began to decline. Heavy purchases by the International Harvester Company, car wheel and cast iron pipe interests, which cut into accumulated stocks, failed to stay the downward movement and the lowest prices of the year were recorded in July. The Southern iron purchased by the International Harvester Company during May netted the furnaces only \$11.75 for No. 2, and the Northern brands were sold on a proportionately low basis.

Following the closing of large orders for finished materials there was a general revival of demand for iron in September, which increased in volume so rapidly that there was grave danger of a runaway market. In the month of October Northern grades advanced \$1.50 a ton and the Southern \$1, and the continued outbursts of buying resulted in similar advances in November. During this period the International Harvester Company covered six months' requirements with the purchase of 60,000 tons of Northern and Southern grades. The American Car & Foundry Company and the Griffin Car Wheel Company aided in the movement of Lake Superior stocks of charcoal iron by purchases approximating 50,000 tons, and the American Steel Foundries closed for 25,000 tons of Northern, Southern and Virginia basic. Weekly sales ranging from 50,000 to 100,000 tons were by no means out of the ordinary, and the anxiety of consumers to cover future needs was reflected in the steady advances made by producers.

In the closing month of the year a quieter market set in, but without loss of strength, as producers rested easily with orders on the books running well through the first quarter of the year, and only in isolated cases have concessions been made from prevailing prices by furnaces that neglected to take their proportion of the tonnage offered during the fall months in their anxiety to book business at the top of the market.

During the greater portion of the year Lake Superior charcoal iron was sold at the furnaces at prices lower than those prevailing for Northern coke No. 2 in Chicago. The usual spread which has heretofore existed in favor of charcoal grades was entirely wiped out and foundries

were not slow to appreciate the unusual conditions and purchased Lake Superior irons in preference to the Northern coke brands. The stock at these Michigan furnaces was estimated at 60,000 tons during the month of July, and until its movement was assured there was no reaction.

On account of the heavy demand prevailing almost throughout the entire year for finished materials the pressure on steel works furnaces was great, and during the month of February the Illinois Steel Company announced its withdrawal from the market as a seller of foundry iron. This was one of the important developments of the year in the Western pig iron trade, as it marked the entire withdrawal of the United States Steel Corporation as a seller of iron. Nor is it probable that the Illinois Steel Company will again re-enter the market, as its present pig iron producing capacity is insufficient to meet its steel works requirements. During the month of October efforts were made to secure a large tonnage of Bessemer iron from Ohio merchant furnaces to overcome the shortage then existing. The iron, however, was not secured, as the heavy purchases of both Bessemer and basic made by the Steel Corporation for Pittsburgh plants cleaned up the entire tonnage through the remainder of the year.

Iron from the three merchant furnaces now in course of erection will not be available until the latter half of 1906. To what extent shipments from outside districts will be affected by this increased capacity remains to be seen, but the rapid growth of this territory insures the absorption of the bulk of this tonnage without materially affecting prices. The following table shows the course of prices during the year, with comparisons for previous years:

Months.	Average Chicago Prices of Pig Iron, 1905.			
	Northern coke No. 2.	Lake Superior charcoal.	Ohio strong soft-ener No. 1.	Southern coke No. 2.
January	\$17.50	\$18.50	\$19.30	\$17.15
February	17.50	18.50	19.30	17.15
March	17.45	18.50	19.20	17.15
April	17.25	18.50	18.80	17.15
May	17.25	17.75	18.60	16.90
June	16.65	17.00	17.60	15.95
July	16.12½	16.50	17.30	15.02½
August	16.30	16.40	16.80	15.45
September	16.25	16.87½	17.23¾	15.52½
October	17.31¼	18.25	18.36¾	16.58¾
November	18.80	19.20	19.55	17.80
December	19.25	20.00	20.05	18.15
Average for the year.	\$17.30¼	\$17.99¾	\$18.50¾	\$16.66¾
Average for 1904.....	\$14.04¾	\$15.50	\$15.64¾	\$13.92¾
Average for 1903.....	18.88½	22.13¾	21.33	18.31¾
Average for 1902.....	20.50	23.50	23.30	20.10
Average for 1901.....	15.00	17.50	16.50	14.60
Average for 1900.....	19.12½	22.00	20.75	18.35
Average for 1899.....	17.65	19.80	19.67	17.75
Average for 1898.....	11.00	11.60	12.00	10.45
Average for 1897.....	10.60	13.00	12.25	10.25
Average for 1896.....	11.70	13.62½	14.50	11.40
Average for 1895.....	11.80	13.75	14.25	11.75

Rails and Track Supplies.

Rail orders placed by Western roads during last year reached the unprecedented total of 1,500,000 tons. This includes about 1,000,000 tons for 1906 delivery, and the transfer of more than 300,000 tons to Carnegie mills at Pittsburgh emphasizes the necessity of increasing the Western rail production. The most notable extension undertaken by Western roads is that of the Chicago, Milwaukee & St. Paul from St. Paul to the Pacific Coast, for which 125,000 tons of rails are required. Numerous other extensions are also under way and they reflect the growth of the Western country.

With the opening of the year the Illinois Steel Company had orders on its books for less than 300,000 tons, but the continued prosperity led the railroads to make greater expenditures, and within three months the capacity of this mill for the entire year was booked. An avalanche of tonnage followed the opening of the books of the rail mills in September for the reception of orders for 1906 delivery, and the Illinois Steel Company sold up the capacity of its mill within 30 days and has since been transferring orders to Pittsburgh. Prices remain unchanged on the basis of \$28, f.o.b. mills, and premiums for prompt deliveries are expected to prevail before the end of the present year.

The demand for light rails during the first half of the year was by no means heavy, but advances in prices which were made during the closing months brought out a large tonnage. Heavy orders for track materials accompanied all rail orders for 1906 delivery, and spikes and track bolts, which ruled low throughout the entire year, have been advanced during the past three months from \$4 to \$5 a ton. Splice bars with rail orders which were sold at \$1.25 in 1905 have been advanced to \$1.50 for 1906 delivery. The erection of the new rail mill in conjunction with an open hearth steel plant by the Illinois Steel Company on the shores of Lake Michigan in Indiana would indicate that the United States Steel Corporation has decided to enter upon the manufacture of open hearth rails. Nothing definite on this is yet obtainable, but the success that has followed the efforts of the Tennessee Coal, Iron & Railroad Company in this direction would indicate that the United States Steel Corporation will soon enter this field.

Shapes and Plates.

On account of the heavy building operations which were carried on throughout the country structural mills were behind on deliveries the entire year. Requirements for large building operations and the South Side Elevated extension in Chicago alone reached a total of 75,000 tons, and during the summer months when the shortage of material became acute premiums for prompt deliveries ranging from \$10 to \$15 a ton were readily obtained. Advances of \$2 a ton each were made in February and September, but these advanced prices in no way interfered with the new construction. A record breaking tonnage was taken by steel car and lake shipbuilders, but the heavy orders already placed for rolling stock and the large number of boats placed with shipbuilders for 1906 delivery insure a still greater consumption from these sources the ensuing year. Nor is there any falling off in the extent of Chicago building operations, contracts already having been closed for the steel required in the erection of the county building, approximating 11,000 tons, and the Northwestern Elevated extension 7000 tons.

The largest structural warehouse and storage yard in the world with a capacity of 10,000 tons was opened during the year by Joseph T. Ryerson & Son. Shipments from this stock at heavy premiums have been made during the past six months to points on both the Atlantic and Pacific Coast, and the many advantages of a warehouse of this kind during periods when production is not equal to the consumption are already apparent.

The pressure on Western mills will be greatly relieved by the operation of the 28-inch mill of the Illinois Steel Company, which has an estimated capacity of 150,000 tons annually. This mill was placed in operation about a month ago, and has since been working on orders transferred from Carnegie mills and no tonnage has been booked against its output for future delivery.

Additions to the country's plate producing capacity enabled the mills to take care of the heavy consumption with fairly prompt deliveries, notwithstanding the heavy requirements for steel cars and lake boats. Prices were advanced \$2 a ton in February, but when shapes were advanced in September plates remained unchanged, and there is now a spread of \$2 a ton in these commodities which have heretofore been sold on an equal basis.

Finished Products.

Notwithstanding the heavy consumption of steel bars and all classes of merchant material prices were maintained at a conservative level, although during the past three months the combined efforts of the leading producers were required to hold values in check. Iron bars not being under association control best reflect market conditions throughout the year, showing a total variation in price of \$7 a ton over the low point recorded in July. Steel bars were advanced \$2 in March and similar advances were made at the same time in all lines of merchant products.

During the summer months iron bars were held on a basis of \$3 a ton below steel, but at the close of the year the spread between the two was \$4 a ton in favor of the latter, and owing to the difficulty in securing early deliveries for steel heavy orders were placed with the

iron mills, notwithstanding the difference in price. Hoops were advanced \$2 a ton in March, September and November, and the customary spread between this commodity and steel bars has been increased \$2 a ton. The average increase in prices over 1904 on iron bars is approximately \$4.70; steel bars, \$3; smooth machinery steel, \$3, and open hearth spring steel, \$2.80.

The increased consumption of bars and light shapes at all the plants of the International Harvester Company so greatly exceeded the output of its steel mill that it became necessary to purchase a large tonnage from other producers, and on July 1 a contract was entered into with the Interstate Iron & Steel Company for the delivery of bars and shapes for a period of one year at the rate of 4000 tons a month.

Merchant pipe and black and galvanized sheets ruled uniformly low throughout the year. The competition in these products is greater than in any other line of steel manufacture, and notwithstanding the big advances made in raw materials during the last four months of the year pipe prices remain unchanged, while sheets show an advance of only \$2 a ton. The following table of prices is interesting in this connection:

Average Chicago Base Prices of Finished Iron and Steel, 1905.

Months.	Common bar iron. Cents.	Soft steel bars. Cents.	Angles, beams, channels. Cents.	Smooth machin- ery steel. Cents.	Open hearth spring. Cents.
January	1.65	1.56½	1.66½	1.81½	2.00
February	1.65	1.56½	1.69	1.81½	2.00
March	1.61	1.66½	1.76½	1.91½	2.10
April	1.60	1.66½	1.70½	1.91½	2.10
May	1.56½	1.66½	1.76½	1.91½	2.10
June	1.51	1.66½	1.76½	1.91½	2.10
July	1.51½	1.66½	1.76½	1.91½	2.10
August	1.57	1.66½	1.76½	1.91½	2.10
September	1.65	1.66½	1.86½	1.91½	2.10
October	1.76½	1.66½	1.86½	1.91½	2.10
November	1.84	1.66½	1.86½	1.91½	2.10
December	1.85	1.66½	1.86½	1.91½	2.10
Average for year ..	1.64½	1.64½	1.78½	1.89½	2.08½
Average for 1904 ..	1.41½	1.49½	1.70½	1.74½	1.94½
Average for 1903 ..	1.64½	1.72	1.75	1.97½	2.57½
Average for 1902 ..	1.71	1.73½	1.75	2.00	2.55
Average for 1901 ..	1.58	1.58	1.70	1.96	2.25
Average for 1900 ..	1.75	1.75	2.00	2.25	2.80
Average for 1899 ..	1.80	1.90	2.00	2.50	2.85
Average for 1898 ..	1.05	1.10	1.25	1.55	1.61
Average for 1897 ..	1.11½	1.13	1.19	1.53	1.66½
Average for 1896 ..	1.30	1.30	1.40	1.62½	1.87½
Average for 1895 ..	1.25	1.37½	1.50	1.70	1.85

Coke.

As artificial rather than natural conditions control the Western coke trade, fluctuations of prices in this market cannot be considered a barometer of the iron trade. The surplus production in the coke fields is usually followed by heavy consignments to this market and fluctuations of 50 cents to \$1 a ton within a few days are not uncommon. These sharp price changes characterized the coke trade during the past year and the Connellsville foundry coke fluctuated from \$4.90 to \$6.30 at different periods.

By-product coke, which is a constantly increasing factor in this market, has sold at the delivered price for the Connellsville product and as prompt deliveries are assured it is generally preferred by most consumers. The by-product coke industry is being rapidly developed in this territory, the By-Product Coke Corporation having just completed 100 ovens at South Chicago and the Milwaukee Solvay Company, Milwaukee, is increasing its plant by the addition of 80 ovens. The increased use of this coke in blast furnace operations is also being considered, the Iroquois Iron Company contemplating the erection of a plant at South Chicago and the new steel works to be erected by the Illinois Steel Company will include a plant of this kind.

Old Material.

The shipment of heavy melting steel from this market to Pittsburgh was the notable development of the year in the scrap market. The tremendous increase in open hearth operations in that district has rapidly overtaken the normal outcome of old material and except in periods of depression this market will continue to be heavily drawn upon to make up the shortage at Eastern mills. Tremendous railroad replacements resulted in unusually heavy offerings of old material throughout the year and

except during the summer months the absorption was equal to the outcome.

The high prices prevailing at the beginning of the year were due to delayed deliveries and the extreme weather rather than to heavy consumption, and the decline that followed in March was not unexpected. The course of the market continued steadily downward until September, when there was a general reversal of conditions and sharp advances were recorded in the following two months. The year's average prices show increases of \$3 and \$4 a ton over 1904, notwithstanding the period of lower values which extended over half the year. The following table shows the course of prices during the year, with comparisons for previous years:

Average Chicago Prices of Old Material, 1905.

	Old iron iron rails.	No. 1 railroad wrought.	No. 1 busheling scrap.	Heavy cast scrap.	Heavy melting scrap.
Months.	Gross ton.	Net ton.	Net ton.	Net ton.	Gross ton.
January	\$21.12½	\$18.18½	\$12.50	\$13.81½	\$14.87½
February	20.00	17.00	11.43¾	13.12½	14.12½
March	19.60	16.40	11.25	13.40	14.45
April	19.75	16.06¼	11.00	13.81½	14.37½
May	18.50	14.18½	9.06¼	12.50	12.55
June	17.15	13.50	9.10	12.40	11.95
July	17.81¼	14.12½	9.62½	13.37½	12.75
August	19.35	15.45	10.80	13.20	13.15
September	20.87½	16.31¼	11.87½	13.37½	14.37½
October	22.12½	17.00	12.00	13.62½	14.50
November	22.90	17.50	12.25	14.30	15.20
December	23.00	18.00	12.50	15.00	15.25
Aver. for year ..	\$20.18	\$16.14½	\$11.11½	\$13.49½	\$13.96½
Average for 1904 ..	\$16.56½	\$12.45	\$8.76½	\$10.95½	\$10.72
Average for 1903 ..	20.28¾	16.07	12.05	14.74½	15.50½
Average for 1902 ..	23.91	19.68½	13.81½	15.03	17.37½
Average for 1901 ..	19.50	15.00	10.80	11.25	....
Average for 1900 ..	17.90	15.00	8.00	11.00	....
Average for 1899 ..	21.00	17.25	10.15	12.40	....
Average for 1898 ..	12.37½	11.25	6.62½	8.15	....
Average for 1897 ..	11.67	10.60	6.44	7.25	....
Average for 1896 ..	13.50	11.20	7.00	8.48	....
Average for 1895 ..	14.12½	11.08	7.67	8.37½	....

Commercial Failures Diminished in 1905.—According to *Dun's Review*, the total liabilities of commercial failures, exclusive of banking suspensions, in 1905, with the closing days of December estimated, amounted to \$103,502,016, the number of such failures being 11,592. These figures compare with final returns of 12,199 failures and \$144,202,311 liabilities in the previous year, while losses were still heavier in 1903. In fact, it is necessary to go back to 1899 to find a year when the total defaulted indebtedness was smaller than in 1905, and no other year makes as favorable an exhibit in over two decades. The real significance of this statement cannot be grasped unless it is understood that the number of firms in business has increased almost steadily and the amount of money involved has also risen beyond all previous records, so that the mortality would have actually diminished even if failures had been the same as in previous years. But with insolvencies fewer in number and liabilities smaller, while the opportunities for disaster increased, the death rate has fallen sharply, which attests the healthfulness of the business situation.

Railroad Receiverships.—One feature of the year 1905 which is in unpleasant contrast to others is the list of railroad receiverships. In the most prosperous year of the country's history no less than 10 companies, with 3796 miles and a total capital of \$175,034,900, were taken over by the courts. This is the worst record since 1896, and with that exception not since 1893, when roads aggregating 5400 miles, with a capitalization of \$275,000,000, failed, is there anything like the showing of the year. The great majority both of mileage and capital is of course involved in the scandalous Cincinnati, Hamilton & Dayton and Père Marquette performance. Contrasted with the railroad receiverships, however, is the fine record of greatly increased railroad earnings and increased dividend disbursements.

The trade statistics of Russia just issued are considered favorable. From January 1 to December 3 the imports totaled \$246,197,500 and exports \$442,040,000. For same period in 1904 imports amounted to \$274,930,500 and exports to \$443,725,500.

The Philadelphia Iron Trade in 1905.

BY THOMAS HOBSON, PHILADELPHIA.

This is the thirtieth annual review of the Philadelphia iron trade furnished by the writer to *The Iron Age*, during which period the growth of this important interest has been much beyond the most optimistic expectations. The output of pig iron in 1875, for instance, was 2,024,000 gross tons, while that in 1905 may be safely estimated at 22,000,000 to 23,000,000 tons, with a very strong probability that 1906 will show a production of 30,000,000 tons or more than that. It is a satisfaction to find that in the 1903 review, as well as that in 1904, the forecast for the ensuing years was singularly correct.

It is not within the scope of this article to estimate what the tonnage of pig iron will be ten years hence, but it is fairly safe to hazard a guess that it will be greater than nine-tenths of the trade would figure on. Ups and downs there will be, as there always have been, and competition may perhaps be as fierce as ever, but even in regard to that the experience of the past year or two leads to the hope that improved methods of marketing material will eliminate at least some of the objectionable features that were so common a few years ago. During the past two years it has been shown that prices may be kept reasonably steady by a mutual agreement in regard to production rather than by price agreements, and this method, there is reason to believe, will become more general as its advantages are better understood.

Forecast for 1906.

The reasons for expecting that 1906 will be a banner year appear to be very numerous, and with this in mind we will endeavor to present as distinct a view of the situation as may be possible.

In the first place it may be said that the iron trade occupies a higher position than ever before. The capacity for production is immensely larger, yet even with that there is considerable anxiety that it may not be adequate to meet the full requirements of the next six months. From a production of 2,000,000 tons of pig iron a year to 30,000,000 tons a year is a long step, but there is as much, if not more, reason to suppose that progress in the future will be relatively greater during the next three decades than it was in the past three. As a matter of fact it is expected to be much larger, not only because of the growth in all lines of business, but of the increasing use of iron and steel for purposes hardly thought of until a comparatively recent period, and is also based on the assumption that the wealth of the country was increased to a greater extent during 1905 than in any former year. The root crops and the yield of mineral wealth in that year surpassed all records, thus placing the country in the front rank financially. A competent statistical authority states that in the 11 Southern States farm properties have "risen in value more than \$1,000,000,000 in two years. The average yield of these lands since this century began is \$200,000,000 a year greater than it was in the preceding six years." Similar conditions exist in the West, Northwest and on the Pacific Coast, so that this furnishes the sinews of war without which rapid progress is impossible.

Then it must be recognized that with increasing wealth there is an increasing appreciation of everything that promises comfort. Better houses, better travelling facilities, better labor saving appliances are all taken up when the means are at hand to secure them, and it is matters of this kind that make the difference between good times and bad times. Great developments along these lines may be expected during 1906, but apart from these an enormous amount of work must be done in the heavier trades. All of these have a great deal more business in hand than ever before. Locomotive building and car building are on an altogether unprecedented scale, while the amount of work to be done on road beds, bridges and terminals is almost beyond calculation. These, of course, will be the back-bone of business during the coming year, but "work makes work" over an ever widening area. Gen-

eral prosperity develops an amount of business in comparatively unimportant lines, which in the aggregate is of considerable magnitude, and especially so when times are as good as they are now. For these and other reasons that might be given there is little doubt that the volume of business during the coming year will surpass all former records. This appears to be the opinion of the trade everywhere.

Prices.

Another matter of very great importance is the question of prices. This subject admits of a wide divergence of opinions. Some people appear unwilling to believe that the country is prosperous unless prices are continually advancing. It will probably be demonstrated that the greatest prosperity the country has ever known will be during the coming year, and if prices are kept steady during that period it may extend into the year following. It is not necessary to discuss the evils of inflation. Experiences in that direction have been too numerous and too recent to be entirely forgotten, but there are special reasons why there should be no inflation in iron and steel prices during 1906, reasons which up to this time probably never existed to the same extent as now. One reason is that with an actual output at the rate of 25,000,000 tons of pig iron a year it must be running pretty close to the capacity for consumption. If it were possible to consume even 26,000,000 or 27,000,000 tons a year, and we could produce only 25,000,000 tons, there is no saying how high prices might go, but it is probable that about 25,000,000 to 26,000,000 tons is the limit for consumption, but even if it should be 27,000,000 to 28,000,000 tons the most credible authorities estimate a capacity at the rate of 30,000,000 tons of pig iron which can be made available early in 1906.

If figures are worth anything (and the authorities in this case are unquestioned) there should still be a fair margin beyond production and consumption, which would no doubt invalidate any attempt to advance prices to anything like the figures ruling from July, 1902, to January, 1903. Another reason is that higher prices would again open our markets to foreign iron, with all the evils and annoyances which invariably follow the introduction of that element. In this connection it may be observed that a very slight upward movement in prices would start shipments from Europe, as there is a general conviction on that side of the water that, as in former years, the United States will have to call on Europe to help it out in periods of unusual activity. This undoubtedly erroneous opinion is liable to cause trouble in some of the European markets at a date perhaps not very far distant. The persistent belief in an American demand has induced a good deal of speculative buying in foreign markets, under which production has increased and stocks have accumulated to very large proportions, and when it becomes clear that the iron will not be wanted prices abroad are liable to drop with a sickening thud. This may not be an immediate result, and there is still a possibility of our prices advancing to a point that will permit Europe to unload on us, but if that can be avoided it is difficult to see what there can be to sustain the foreign markets.

Stocks of pig iron in Connal's stores in Glasgow and Middlesbrough on December 1 were a trifle over 760,000 tons against 178,000 tons at the same date in 1904. British makers are also blowing in new furnaces almost every week, expecting that sooner or later the iron will be wanted for the United States. When it is realized that there is but little chance in that direction a sharp reaction in their prices will almost inevitably begin, and it would be most unfortunate if prices on this side were high enough to permit the United States being used as a dumping ground for foreign material.

It is not impossible that pig iron prices may advance to \$20 or over, but it is not a probability, and certainly higher prices than that could not be maintained for any length of time. The United States is a wonderful consumer, but it is also a wonderful producer, and the proportions are so nicely balanced that prices are not likely

to have such violent fluctuations as they had in former years; neither is it likely that we shall ever be under the necessity of making large imports of pig iron as in the past.

One thing that may advance prices is the threatened scarcity of ores. It is claimed that there will be a heavy shortage before new ores can be brought down, but for the present there is no occasion for great uneasiness on that score.

Looking for the Greatest Year.

Taking everything into consideration, 1906 promises to be the greatest year the trade has ever known—great in the volume of business, satisfactory in profits, and also in the uniformity of activity. The demand for labor is greater than ever before, and when the working classes have money to spend it adds immensely to the general prosperity. The first half of 1906 is amply provided for, and even if crops this year are not as good as they were last year there is enough surplus to prevent any serious setback. If, however, the crops are anything near those of 1905 there is no reason why business should not be good during even 1907 and 1908 also.

An almost endless chain of work will develop during the coming year, and if nothing unforeseen occurs there is no reason why the United States should not continue on the basis of a 25,000,000 to 30,000,000 ton consumption of pig iron for an indefinite period. Ups and downs there will be, but there is no reason why the swing of the pendulum should be as wide as during the three decades ending with 1899. The reaction during 1903, as a matter of fact, was not anything like that from 1875 to 1878, nor like that from 1893 to 1898, and, barring the violent revulsion in prices from \$25 for pig iron in 1900 to \$15.50 in 1901, it can hardly be said that there has been any real depression during the past six or seven years. Pig iron quickly recovered from \$15.50 in 1901 to \$24 in January, 1903, but again the market broke, touching \$14.25 during 1904.

Business during the entire period, say 1899 to the present time, has never been really bad, and what have been regarded as bad years were really periods of price adjustments, with some natural reaction following two or three years of unprecedented activity. It is therefore extremely probable that the permanency of favorable conditions will be greatly conserved by prices being kept within moderate limits. Slight reductions will no doubt be made when there are indications of oversupply and slight advances when there are evidences of approaching scarcity. The same principle applied to the production of pig iron would do much to prevent unwarrantedly high prices or to prevent undue depression.

The advance in the cost of fuel and ores is equal to \$2 more on pig iron than during last year, so that there is but little possibility of a decline from present prices and which should be tolerably close to the average for the whole of 1906. If prices should be higher at any time during the year it will probably be during the first six months, as by the last half the productive capacity will be larger. Crops can also be fairly estimated, and if there have been any imports of iron, the character and the effect can be fairly measured. These suggestions may require revision as the year advances, but they are at least reasonable assumptions based on past experience and present conditions as they appear at the present time.

Pig Iron.

Prices during 1905 were remarkably uniform, and considering that the volume of business was the largest on record it is interesting to note that \$2 to \$2.50 per ton cover the extreme range from highest to lowest. The great bulk of the business was done within a smaller range than that, as about half a dollar of the gain was made during the last month. There can be no doubt that this uniformity has been largely due to superior management which has been directed for the general good of the trade, rather than to secure fancy prices at one time, or to forestall others in case of a weak market. Meetings of pig iron manufacturers have been held at regular intervals, not to fix prices, but to compare notes, and when it was found that stocks were getting too heavy a *pro rata* decrease in production was agreed upon. When better

conditions were indicated consumers were liberally dealt with, and prices were moved so gradually that fears of "being left" were almost entirely allayed. As a matter of fact, there has been no time within the past 30 years with so little price disturbance as during 1905, and it is the best possible assurance that the same methods in 1906 will have similarly favorable results. It is remarkable that with all the business that was done during 1905, prices of mill and foundry irons are only \$1 per ton higher than they were a year ago. Basic iron is \$1.50 to \$2 higher, but there is an increasing consumption of that class of iron, and it is likely to be more of a factor than ever during the coming year.

Taking everything into consideration, there is little doubt that anticipations of a great business during 1906 are well founded. As already noted, prices are not likely to go much beyond those that are now quoted, but for the present there certainly appears to be no good reason for a decline, although in consequence of the holidays and the fine weather furnaces have bettered their condition considerably for making deliveries. Quotations are unchanged, but sellers are less insistent on the outside quotation, while others are disposed to accept the inside figure when the buyer is strictly first class. This may continue all through January or longer, and if fine weather continues, enabling furnaces to do their best work, it is not impossible that quotations may have to be revised a little before the end of the month. In other words the market is likely to be thoroughly tested before buyers come in for large lots. There was something of a scarcity during the last two months of the year and deliveries are a good deal behind, so that even if there is not much new business there will be plenty to do in catching up with back orders. This is not a new feature in the early months of the year and there is no reason why 1906 should be an exception, even though the tonnage engaged during the first half of the year may prove to be the greatest on record.

Profits at the consuming end have not been so large as to create too much optimism, and buyers will probably be more conservative than formerly, as there can be little doubt that the tendency of the times is toward larger outputs, economy in management and uniformity in prices. There is no reason why very handsome returns should not be made under such conditions, so that, while high prices are strongly deprecated, there is no reason for discouragement as regards profits. It is certainly an entirely new record to have a consumption of more than 40,000,000 tons of pig iron in two years, as in 1904 and 1905, with the extreme fluctuations in prices of less than \$4 per ton, comprising two whole years when 50 per cent. more iron was made and marketed than during any similar period in the entire history of the trade.

The reasons for not expecting any more "boom prices" have already been given, but another is that too many furnaces are ready or will be ready to go into operation in a few months' time. There is in some quarters, however, a kind of "bogey scare" that ores will fall short before the opening of navigation, in regard to which the writer has no special information. Such a contingency would be liable to affect prices temporarily, but the trade has to take its chances on that, although such a contingency would be unfortunate in more ways than one. Other things are liable to happen in course of a year that would greatly change the situation, but what has been said is based on conditions as they appear to be to-day, and as they are likely to be for some time to come, subject to a reasonable margin for the unforeseen developments.

The following table will show the range of prices at Philadelphia during the year, the quotations here given being for the first week in each month:

Months.	No. 2 X foundry. Per ton.	No. 2 plain. Per ton.	Standard gray forge. Per ton.	Basic Per ton.
January 1, 1905.....	\$17.50	\$16.75	\$16.25	\$16.25
February 1.....	17.50	17.00	15.75	16.50
March 1.....	17.75	17.25	16.25	16.75
April 1.....	18.00	17.25	16.25	17.00
May 1.....	18.00	17.50	16.00	17.00
June 1.....	17.25	16.50	15.75	16.25
July 1.....	16.25	15.75	14.50	16.00
August 1.....	16.50	16.00	15.00	15.25
September 1.....	16.25	16.00	15.00	15.75
October 1.....	17.25	16.75	15.75	17.00
November 1.....	18.00	17.50	16.25	17.50
December 1.....	18.50	17.75	16.50	17.90

Steel.

Movements in billets and slabs have not been of any great significance, nor have prices shown any great variation. Prices in January began at \$25, advanced to \$26 in February, \$28 in March and \$29 in April. This seemed to be the culmination, as a gradual decline commenced, during which quotations were \$28 in May, \$27 in June and \$26 in July. In August a recovery set in, the price during that month being \$26.50. In September it advanced to \$27, in October to \$28, in November to \$29 and to \$30 in December.

There has not been much change in the productive capacity in this territory, owing to the suspension of the Diamond State Steel Company's plant at Wilmington, Del., and the Tidewater Steel Company's plant at Chester, Pa. The Alan Wood Iron & Steel Company has made important additions to its plant and the Harrisburg Pipe & Pipe Bending Company is also producing a considerable tonnage, part of which is for sale in the open market. The net increase, however, is not important. The local trade absorbs most of the steel made in this district, which for the time being is none too large for requirements, but with the rehabilitation of the Diamond State Steel and Tide water companies, now among the possibilities of the not distant future, conditions may be less favorable, unless there is a still further increase in the demand for steel, which of course is in any case merely a question of time.

Plates.

The plate trade during 1905 was of large volume, but prices were remarkably uniform, only one change being made during the entire year—viz.: in February, when the price advanced from 1.63½ to 1.73½ cents, Philadelphia, and so continues to this date. Nothing out of the usual course occurred during the entire year, the mills as a rule running more uniformly full than ever before. It cannot be said that there was any overcrowding or that fairly prompt deliveries could not be had at almost any time, but the capacity of the mills is so much greater that the increased consumption is hardly noticed. The output of the Eastern mills is estimated as equal to 550,000 to 600,000 tons per annum, which would have been regarded as beyond all possibility a few years ago. A large proportion of the output is boiler and high grade steel, for which the Eastern mills have a very high reputation. There has been no year on record when prices were as uniform as during 1905.

Bars.

Manufacturers of bar iron have no doubt found that 1905 was a good year for their business. Prices were never very high at any time, neither were they so low as to be unprofitable, so that the outcome has no doubt been quite satisfactory. The extreme range of prices was not more than three-tenths of a cent per pound during the whole year, while one to two-tenths of a variation would cover the great bulk of the business. Prices began in January at 1.63½ cents, Philadelphia, advanced during the month following to 1.73½ cents and officially have remained at that figure to the present time. The demand has been so good, however, that official quotations have not had much influence, so that when manufacturers thought they ought to get a little more money they quoted accordingly, and usually got what they asked. It may be said, however, that the productive capacity has not been increased as in other lines, so that local competition is not as strong as in former years. Steel bars, however, are close competitors and if they could have been supplied with anything like promptness the bar iron trade would have had a decidedly less favorable year than it has had.

Prospects for 1906 are very good. The only drawback is the possibility of larger supplies of steel bars, which is certainly one of the probabilities in the perhaps not very distant future. The minimum prices of to-day are 1.83½ cents for refined bar iron, the general asking price being 1.93½ cents, an advance during the year of two to three tenths on iron bars. Steel bars are only a tenth higher than they were a year ago, but deliveries cannot be had in any reasonable time unless by paying a tenth to two-tenths more than the nominal quotation, so that they are practically on a parity with iron bars.

Old Material.

The year 1905 has been one of somewhat wide fluctuations in prices compared with the movements in finished products. Steel is the leading commodity, and the chief interest centers in that article. The lowest price in the year was \$14.50 during July, the highest was in November and December, when \$18 was paid, and in a few instances a trifle over that for choice lots of good size. The general outlook is fairly satisfactory, although there is no department which is harder to size up than the scrap trade. Steel scrap is an exceedingly speculative article. At times dealers try to corner the market; at other times consumers by united action try to break it, neither one having had any very marked success thus far, although of course prices were somewhat affected temporarily. At the moment prices do not appear to be very strong. The fine open weather has facilitated a free movement of all kinds of material, and if it continues there will be plenty of scrap during the early months of the year. It may have a reverse influence at a later date, because if less material has been accumulated during the winter there will be so much the less for sale during the spring and summer months. About all that can be safely said is that prospects indicate easier prices in the near future, but how long the dullness may continue and how far it may affect prices time alone can answer. The range of prices from month to month will be shown by the following table:

	Jan. 1.	Feb. 1.	Mar. 1.	April 1.
No. 1 steel scrap.....	\$16.50	\$17.50	\$17.75	\$18.00
Old iron rails.....	20.50	23.50	23.50	25.50
Old car wheels.....	15.25	16.25	16.25	17.25
Choice scrap, R. R. No. 1 wrought.	19.75	22.00	22.00	23.25
Machinery scrap.....	15.25	16.25	15.75	16.25
Wrought turnings.....	13.00	14.75	15.25	15.50
Cast borings.....	10.25	11.25	11.25	11.50
Stove plates.....	13.75	13.75	13.75	13.75
Wrought iron pipe.....	15.25	16.75	16.75	16.75
	May 1.	June 1.	July 1.	Aug. 1.
No. 1 steel scrap.....	\$16.50	\$15.25	\$14.75	\$15.75
Old iron rails.....	22.75	20.50	18.50	19.00
Old car wheels.....	16.50	15.75	14.25	15.50
Choice scrap, R. R. No. 1 wrought.	20.25	18.50	15.75	17.50
Machinery scrap.....	15.50	15.25	14.25	14.25
Wrought turnings.....	14.25	13.25	10.50	12.25
Cast borings.....	10.25	9.75	7.75	8.75
Stove plates.....	11.25	10.75	9.50	11.25
Wrought iron pipe.....	15.25	14.25	11.75	13.25
	Sept. 1.	Oct. 1.	Nov. 1.	Dec. 1.
No. 1 steel scrap.....	\$15.75	\$16.25	\$17.75	\$17.75
Old iron rails.....	22.50	22.50	24.50	24.50
Old car wheels.....	15.75	15.75	17.25	19.00
Choice scrap, R. R. No. 1 wrought.	20.75	21.50	22.75	22.25
Machinery scrap.....	15.25	15.75	16.25	16.25
Wrought turnings.....	13.75	14.25	14.75	15.00
Cast borings.....	9.75	10.00	10.25	10.75
Stove plates.....	13.75	12.75	13.25	13.50
Wrought iron pipe.....	15.75	16.25	17.25	16.75

The United States Treasury Deficit.—Washington advices state that on Saturday, December 30, the Treasury closed the first six months of the fiscal year with a deficit of only \$7,673,340, as compared with \$22,378,894 a year ago, and Treasury officials are hopeful of a continued excellent showing through the next six months. Since this fiscal year opened the deficit has been whittled down steadily, and some are so sanguine as to predict that when June 30, 1906, comes the deficit will be eliminated entirely. Total receipts for the first six months of the present fiscal year have been \$296,858,749, as against \$277,649,852 at the end of December, 1904, an increase for the period of about \$20,000,000. Expenditures the first half of this year have been \$304,532,089, as against \$300,028,747 for the first half of the last fiscal year. The abnormally large receipts have made this good showing possible.

Gustav H. Schwab, American agent of the North German Lloyd Steamship Company, says that "upon the prosperity of the United States depends the profits of the transatlantic steamship companies. Indeed, the first-class passenger service almost entirely depends upon the travel of Americans. The number of Europeans using first cabins is almost infinitesimal in comparison with the vast patronage of Americans."

PERSONAL.

A. M. Fowler, well known in the Central West as superintendent and works manager, has accepted the position of superintendent of the Vulcan Iron Works, San Francisco, Cal.

Frederick A. Waldron, Stamford, Conn., has given up his engineering business and his connection with the Yale & Towne Mfg. Company, having accepted a position with the National Cash Register Company, Dayton, Ohio, as works engineer.

Thomas S. Hanna, formerly with the Howe-Brown Company and later with the Colonial Steel Company, Pittsburgh, is now associated with the Baldwin Steel Company, 107 John street, New York.

Henry F. Devens, who has been purchasing agent at Dayton, Ohio, for the National Cash Register Company, became general purchasing agent for the company on January 1, with headquarters at 1020-1022 American Surety Building, New York.

John R. Hastings, vice-president of the Sharon Steel Hoop Company, Sharon, Pa., has resigned to engage in another line of business, but will not sever his connection with the company for a month or two.

C. J. Connor has been appointed purchasing agent of the Oil Well Supply Company, Pittsburgh.

John A. Topping, the retiring president of the American Sheet & Tin Plate Company, gave a dinner December 30 at the Duquesne Club, Pittsburgh, to the sales managers, district managers and heads of departments. E. W. Pargny acted as toastmaster. Mr. Topping was presented by his former associates with a costly watch, and gave each of them a gold lead pencil suitably inscribed.

Following the resignation of John A. Topping, president of the American Sheet & Tin Plate Company, Pittsburgh, which became effective January 1, C. W. Bray was elected president, E. W. Pargny first vice-president and S. A. Davis second vice-president. C. W. Bennett, formerly district manager of the Elwood, Ind., district, has been moved to Pittsburgh and made assistant to President C. W. Bray. Messrs. Bray, Davis and Bennett will look after the operating department and E. W. Pargny after the commercial department.

Charles S. Guthrie, chairman of the Republic Iron & Steel Company, who underwent an operation at his North Carolina place on December 30, is reported to be making a good recovery.

Herman Isaacs, importer, New York, sailed last week for Germany on business connected with the structural steel trade.

Bridge Charges Reduced at St. Louis.—On January 1 the terminal charge or bridge arbitrary assessed on every ton of freight entering the city of St. Louis was reduced by the Terminal Railway Association, which owns the Merchants' and Eads bridges, an average of 50 per cent. The terminal charge on some commodities was reduced only 25 per cent., while on some others the reduction amounts to as much as 75 per cent. At the same time the 14 railroads in this association announced their intention of accepting through bills of lading to St. Louis. Heretofore all shipments have been consigned to East St. Louis, where they were rebilled to St. Louis. The terminal charges in force before the recent reductions became effective amounted to 30 cents a ton on coal and on first-class commodities from 40 cents to \$1 a ton. These concessions were made by the railroads in an effort to appease the large industrial interests in St. Louis that have been demanding the construction of a free bridge over the Mississippi River, but the manufacturers' committee that has sought relief from these outrageous charges announces that the fight will continue, notwithstanding the reductions granted.

The blast furnace of the Musconetcong Iron Works at Stanhope, N. J., which has been under the management of John S. Kennedy for the last seven years, was blown out for repairs a few days since, after making a notable

runs of 46 months for the blast. The furnace produced 118,255 tons of pig iron and was banked nearly three months during the coal strike of 1903. The fuel used was anthracite and coke, mixed in the proportions of 45 per cent. anthracite and 55 per cent. coke for the entire blast.

OBITUARY.

JOHN DOUGHERTY, president of the New York Continental Jewell Filtration Company, died in the New York Hospital December 28. He was born in Ireland in 1840 and came to this country when a boy. In 1863 he entered the employ of the Pennsylvania Railroad Company and later became assistant secretary. In 1880 he was made comptroller and assistant treasurer of the Denver & Rio Grande Railroad, the Mexican National Railroad and their allied construction companies. Four years later he became treasurer, auditor and purchasing agent of the Buffalo, New York & Philadelphia Railroad, which was later the Western New York & Pennsylvania and is now part of the Pennsylvania system. This position he left in 1888 to become general manager of the Colorado Coal & Iron Company, which was then in course of reorganization.

JAMES MACNAUGHTON, president of the MacIntyre Iron Company of the Adirondacks, died December 29 at his residence in New York. He was born in Albany in January, 1851, and was educated at the Albany Academy and the Yale Scientific School, from which he was graduated in the class of 1871. In 1876 and 1877 he was employed in the Croton Aqueduct Bureau as a civil engineer in connection with the surveys for new reservoirs at Carmel and elsewhere in Putnam County. Later he was engineer on the construction work of the West Shore Railroad. He accompanied the expedition sent out by the British Government on the Alert for exploration in the Hudson Bay country. Mr. MacNaughton was a member of the Engineers' Club and of the American Society of Civil Engineers.

J. H. HILLS, one of the owners and for the past two years superintendent of the Haydenville Brass Works, Haydenville, Mass., died December 24, aged 50 years. He was a native of Haydenville and lived all of his life there excepting a few years passed at Lorain, Ohio, where he was with the Joel Hills Brass Works.

FREDERICK ALEXANDER GRIFFIN, assistant superintendent of the Empire Iron & Steel Company, died at Reading, Pa., December 20, from pneumonia, aged 31 years. He was born at Ossining, N. Y. He is survived by his widow.

ANDREW G. WILSON, general manager of the marine department of the Maryland Steel Company at Sparrows Point, with which he had been connected for the past seven years, died December 22 at his home in Wilmington, Del., from heart failure. He was a native of Delaware and had lived for the greater part of his life in that State. For 36 consecutive years he was in the employ of the Harlan & Hollingsworth Company, Wilmington, as superintendent of the company's works. He was a member of many social and business organizations, among them being the Society of Marine Engineers and Naval Architects and the Engineers' Club of New York. He is survived by a widow and four children.

The Manhattan Bridge Contract Still Held Up.—The Appellate Division of the Supreme Court of New York handed down a decision December 30 affirming the order issued by Justice Dowling enjoining former Bridge Commissioner Best from giving a contract to the Pennsylvania Steel Company for the construction of the Manhattan Bridge over the East River. Justice Ingraham dissented. Justice Dowling granted the order enjoining the Bridge Commissioner from awarding the contract, on the ground that the specifications were not properly drawn, in that the cost of the superstructure was not limited as required by the law, and also for the reason that the specifications provided that nickel steel should be used, although it is much more expensive than ordinary steel, and has not been tested in actual use in bridge construction. The action was brought by Peter A. Gage, a taxpayer.

Copper Mining in 1905.

BY HORACE J. STEVENS, HOUGHTON, MICH.

A Statistical Survey.

Although the United States now produces more than half of the world's copper supply this has been the case for but a comparatively short period. A quarter century ago, in 1880, the United States made but 27,000 tons of the world's total copper supply of 153,959 gross tons—only 17 per cent. of the total. Ten years ago, in 1895, the United States for the first time made more than half the world's total output of copper. The following table gives the American copper production by States for 1904, from the official figures of the United States Geological Survey, with an estimate of the production for 1905. As the final figures will not be available for some months the statistics for 1905 must be taken merely for what they purport to be—that is, as close an approximation of the exact figures as can be arrived at from the necessarily somewhat fragmentary data at command in the closing days of the year:

Copper Production of the United States.

State.	Pounds avoirdupois.	
	1905.	1904.
	Estimated.	Official U. S. Geological Survey.
Montana	335,000,000	298,314,804
Arizona	255,000,000	191,602,958
Michigan	221,000,000	208,329,248
Utah	60,000,000	47,062,889
California	20,000,000	28,529,023
East and South	16,500,000	15,211,086
Colorado	8,000,000	9,506,944
New Mexico	8,000,000	5,368,666
Wyoming	7,500,000	3,565,629
Alaska	6,500,000	2,043,586
Idaho	3,000,000	2,158,858
Miscellaneous	2,500,000	863,694
Totals	943,000,000	812,537,267

The totals for 1905 look alarmingly large, indicating as they do an increased production of upward of 130,000,000 pounds for the United States, as compared with an increase of 114,000,000 pounds in 1904, and of 57,000,000 pounds in 1903. The largest increase ever made in any previous year was 114,000,000 pounds in 1904, and before that the largest increase was approximately 80,000,000 pounds in 1896. The increase for the single year, as indicated by the preceding table, is greater than the total production of American mines in 1883. The increase in production in 1904 was 16 per cent. and for 1905 was the same amount.

In 1904 Arizona recorded its largest increase in output up to that time, gaining 44,000,000 pounds in production over 1903, equivalent to an increase of 30 per cent. According to the estimate submitted above for 1905 the increase in production over 1904 amounts to upward of 63,000,000 pounds, a gain of 33 per cent.* Were it not for the marvelous developments of 1905 in the Butte camp it would be a foregone conclusion that Arizona would step to first place among the producing States of America within a very short period, and even as it is Montana must look to her laurels in the face of the fierce competition from the young giant of the Southwest.

The Large Producers.

In the following table is given a list of the 26 mines of the United States that have produced 10,000,000 pounds or more of copper during 1905, the figures for 1904 being official in a considerable number of cases. In the great majority of cases the estimates for 1905 will be found close approximations of the actual figures, particularly in the case of Lake Superior mines:

Production of the Leading Mines.

Mine.	Pounds avoirdupois.	
	1905.	1904.
Anaconda	105,000,000	90,000,000
Boston & Montana	90,000,000	94,000,000
Calumet & Hecla	82,500,000	80,351,019
Copper Queen	75,000,000	58,605,000
United Verde	38,000,000	29,500,000
United Copper Company	35,000,000	35,311,853
Arizona Copper Company	33,000,000	32,197,760

* There is some danger that Mr. Stevens has included in this total the copper contents of Mexican ores and matte, which are treated at reduction works located in Arizona, but which should not be counted as Arizona products.—EDITOR.

Calumet & Arizona	32,500,000	31,634,895
Old Dominion and United Globe	32,000,000	15,368,147
Original	30,000,000	20,500,000
North Butte	23,000,000	.....
Trenton & Washoe	20,000,000	.....
Quincy	19,250,000	18,343,160
Detroit	19,000,000	16,623,251
Osceola	18,750,000	20,472,429
Tamarack	16,000,000	14,961,885
Champion	15,750,000	12,212,954
Utah Consolidated	15,500,000	13,553,493
Butte & Boston	15,000,000	12,000,000
United States	14,500,000	12,000,000
Baitie	13,750,000	12,177,729
Bingham	13,000,000	11,500,000
Shannon	12,500,000	11,899,920
Parrot	12,000,000	12,500,000
Trimountain	11,250,000	10,211,230
Mountain	10,000,000	21,116,160

† In 1904 the Amalgamated Copper Company produced much more copper than is indicated by the total production of the Anaconda, Boston & Montana and Butte & Boston estimates in the 1904 column, large quantities of outside ores having been smelted.—EDITOR.

The Copper Queen of Arizona shows the largest increase in output of any American mine in number of pounds,** but the United Globe and Old Dominion properties of the same Territory have more than doubled production during the year and have by no means as yet reached the limit of their productive capacity. Senator Clark's original mine, formerly known as the Colusa Parrot, at Butte, has greatly increased production with the aid of a new and modern reduction plant. Senator Clark's United Verde of Arizona also has increased production with a new plant, but the output is not yet back to the high-water figures of a few years ago. The North Butte is a new company, including the old Speculator and adjoining properties, and has been the sensation of the year in American copper circles. It is now making copper at the rate of about 3,000,000 pounds monthly and for 1906 should turn out between 35,000,000 and 40,000,000 pounds of fine copper, thus taking rank among the ten largest copper producers of the globe. The ore is treated at the Anaconda smelter. The Trenton and Washoe properties are Butte mines, closely connected with the Anaconda, and are controlled by the Amalgamated Copper Company.

Heavily Increased Production Promised.

In Michigan the Lake Superior copper mines have increased production about 12,000,000 pounds only during the year, but should show at least as large an increase next year and a greater increase in 1907. The district may be relied upon to increase its production steadily year by year for at least five years to come from work now under way, and it is probable that still further development work to be undertaken during the next five years will continue the supply of new mines beyond that period.

In Montana there has been a surprising reversal of form during 1905. It was generally felt one year ago that, while Montana had some of the largest and richest mines of the world and would continue the leading copper producing district for years to come, no great increase in output could be looked for under normal conditions and future discoveries of new deposits would be comparatively infrequent. As a matter of fact, the Butte camp has made the greatest progress during 1905 that it ever has made in every material respect. The increase in production is greater than in any previous year, and the richly productive area of the camp has been enormously increased. The North Butte apparently is another Boston & Montana, while discoveries in the Anaconda in the closing month of the year have changed the aspect of that property from a declining producer to one with its best years ahead. Diamond drill borings have shown the Anaconda ore bodies to be rich and wide for 1000 feet below the present bottom workings of the mine, and developments by the North Butte to the northward and by the Pittsburgh & Montana and other properties to the eastward indicate most strongly that the unworked territory of the Anaconda, which is of great extent, will develop large ore bodies of high grade.

Arizona, although it has broken all records twice in the two past years, has by no means reached its full growth. In Michigan there is but a single copper district, although this is at least 150 miles long, with an

** The product given includes the copper contents of outside Arizona and Mexican material, which ought not to be credited to the mine.—EDITOR.

average width of perhaps 4 miles. In Montana there is only one important camp, and that has but a few square miles area. In Arizona, on the contrary, there are four important fields of production, widely separated, with at least two other fields of importance that will be heard from very shortly, and half a dozen other districts of more or less promise. Arizona has an area of 110,000 square miles, and there is not a county in the territory that does not show copper in promising quantities.

The 1905 copper output of Utah does not show any large increase, though the gain is a substantial one. The developments of the year have been of the greatest importance and warrant high expectations for the future.

In California the production has fallen off, but the loss is only temporary. There are more than a dozen counties that show copper deposits of commercial importance, but the bulk of the production has come from Shasta County and from a single mine, the Iron Mountain. This is not worked out, but the necessity of exploiting the lower grade ores has led to a change of base by which the smelters are transferred to tidewater near San Francisco. The Bully Hill mine, which has been the second producer of the State for several years, has been taken over by the General Electric Company.

Mexican Trade and Development in 1905

DURANGO, December 28, 1905.—The people of this republic have every reason to look back upon the year with feelings of satisfaction. Uninterrupted activity has ruled in the various lines of industry, and if the distressing inundation at Guanajuato in the summer be excepted, whereby several lives were lost and a large quantity of property was destroyed, no disaster of a serious character can be charged up against the year now closing.

The Currency Question Settled.

Perhaps the greatest achievement of the Government during the 12 months has been the satisfactory settlement of the vexatious currency question, which at the year's opening was still in abeyance. The free coinage of silver having been stopped and the country placed upon a sound money basis, it was natural to expect that greater confidence would be established among all those people who were financially interested in the country's progress, and this expectation has been realized. Foreign investors have not been slow to attest their appreciation of the Government's action, for the influx of capital during the closing half of the year has been unusually large and the investments widely distributed, the United States, France, Germany and other European countries being participants. In a country whose chief capital is its rich natural resources money is, of course, an essential for their development, and next to this, or it may perhaps be said equally important, are men and muscle. It is encouraging to note that the year has shown a perceptible turn in the tide of immigration, a goodly number of foreigners of various nationalities having come in with the intention of making their homes here.

The mining interests in most of the established camps have prospered throughout the year. More than usually large shipments of modern machinery have been received and installed. The new monetary laws have not seriously hampered the miners of silver bearing ores. The production of copper has largely increased, Mexico now ranking second as a producer of the metal. Of late increased attention has been given to the mining of zinc ores, the demand from the United States having greatly augmented within a few months.

Railroad Construction

was never more energetically pushed than it has been during the last six months. This most favorable sign of progress has not been confined to any locality or system. North, south, east and west the great civilizing movement, the grading of new trackage and the laying of steel rails, has gone on until districts hitherto isolated have awakened from their lethargy and now add their quota to the sum of the nation's wealth. The Mexican Central Railway Company has materially increased its mileage by purchase and by extensions and is now push-

ing with characteristic energy its line to the Pacific Coast. The Kansas City, Mexico & Orient Railway Company must also be given credit for vigorous construction work, as well as for the missionary labors of its resourceful president, who has made known widely abroad the opportunities which the republic offers to capital.

The nation's own important railroad enterprise, the Tehuantepec National, has almost reached the stage where it must become a factor in the problem of interoceanic transportation. Another year will in all likelihood mark the completion of its terminus.

A goodly number of concessions have been given during the year for new railroads. While it may be taken for granted, without reflection upon their promoters, that many of them will never reach the track laying stage, several are meritorious propositions, supported by ample capital, and will in due time materially increase the country's actual mileage.

A marked movement has been visible during the year in the direction of improved agricultural methods. This has made itself apparent in increased sales of modern farming implements and in a widespread effort on the part of large and small land owners to promote irrigation, signs which bespeak a growing intelligence among a most important class of the population.

Increased Duties on Iron and Steel.

With respect to the iron and steel manufacturing industry the chief matter of interest has been the imposition of increased duties upon imported products, thus giving a larger measure of encouragement to domestic manufacturers. No new works of importance have been established during the year. In the line of industries which are large consumers of iron and steel products a notable addition to domestic plants has been the establishment of the plant of the Mexican Car & Foundry Company in the Federal District, which has recently begun operations.

The companies engaged in prospecting for petroleum and those who claim to have discovered it in commercial quantity have been busy throughout the year. The principal companies engaged in this industry are the Oil Fields of Mexico Company, S. Pearson & Son, Limited, and the Mexican Petroleum Company. The last-named is reported to have closed a contract with the Mexican Central Railway Company to furnish crude oil for fuel to the entire system.

Trade with foreign countries has continued to expand. The increase in the value of imports in the last fiscal year was more than \$7,000,000 over the aggregate for the preceding one. The United States fairly maintains its supremacy as the source from which Mexico draws the major portion of her manufactured products, but there are many rivals for her favors. With the expansion of the market, consequent upon the development of the country's great material wealth, which in many of its phases is as yet unexploited, competition will become still keener. To hold the position which proximity and the quality and variety of their manufactures have enabled them to attain the exporters of the United States will find it incumbent upon them to study the growing requirements of Mexican consumers and to solicit their trade as courteously, intelligently and persistently as do their European competitors.

J. J. D.

The selling organization of the Central Iron & Steel Company, Harrisburg, Pa., now includes the following representation apart from the home office: George H. Lloyd & Co., Boston; William H. Wallace & Co., New York; C. K. Barnes & Co., Philadelphia; R. C. Hoffman & Co., Baltimore; W. H. H. Newman & Co., Buffalo.

The Executive Committee of the Shafting Manufacturers' Association had a meeting in New York this week. The association some time ago reaffirmed prices. There was a little irregularity in the market some months ago after the advance to the present basis was made, but more recently prices have been generally maintained.

John H. Heimbuecher, manufacturers' agent, has removed from 306 Mechanics' National Bank Building, to 1310 Chemical Building, St. Louis.

The Iron and Metal Trades

The volume of business done in nearly all the leading distributing centers during the past week has been much larger than is usual in the holiday season, and the industry enters the new year under tremendous pressure.

In the Pittsburgh district negotiations are still progressing between the merchant furnaces and the Steel Corporation. The latter interest is on the eve of closing for a considerable tonnage of Basic Pig to cover the requirements thus far unprovided for for the Eastern plants for the first half of this year. Some other sales of Basic Pig have been made in eastern Pennsylvania at close to \$18 delivered, and there have been marketed also with two consumers an aggregate of 5000 tons of Low Phosphorus Iron on the basis of \$23 at furnace. The leading makers of Foundry and Forge Iron in the Schuylkill and Lehigh Valleys have advanced their prices 25 cents per ton and have effected sales at the advance. In Chicago and Cincinnati there is increased interest, there having been some round sales of Malleable Bessemer in the former district. The Cast Iron Pipe interests are buying both in the East and in the Central West, Cincinnati noting an inquiry for 18,000 tons.

The Southern railroads announce an advance in the freight rate on Pig Iron to points North of 25c. a ton, effective March 1.

Rail makers report additional orders, the largest this week being for 15,000 tons for the Oklahoma Central. It is now definitely announced that the Baltimore & Ohio order negotiated some time since is for 71,000 tons.

Bridge builders are active. The largest tonnage placed during the week is that of the bridges for the Northern Pacific, which calls for 20,000 tons and includes the structures over the Columbia and Willamette rivers. How heavy has been the business of the year just passed is indicated by the fact that the American Bridge Company booked during 1905 an aggregate of 540,000 tons. Its capacity, which was enlarged during the year, is now placed at close to 700,000 tons.

Bridge builders, structural shops and jobbers in the Chicago district have during the past week contracted for a large amount of Structural Material and Plates for delivery this year, to apply to forthcoming work.

During the past few weeks the German Steel Syndicate has sold 20,000 tons additional of Structural Shapes, making the total since the movement began about 60,000 tons. This is exclusive of the business in the same line done by representatives of Belgian mills. The German Syndicate has advanced the price to £6, c.i.f., equal to about 1.80c. per lb., duty paid, New York.

One of the leading Eastern Plate mills has just decided to ask an advance of \$2 per ton on all heavy Plates and \$5 per ton on No. 10 Plates. On the lakes the shipbuilders are figuring on two additional boats.

The makers of Cold Rolled Shafting have just received a number of heavy contracts from customers for delivery over the first half of the year.

The Wire makers are expected to announce an advance of \$1 per ton at an early date. It is stated that the putting up of the price has been virtually decided upon.

A Comparison of Prices.

Advances Over the Previous Month in Heavy Type.
Declines in Italics.

At date, one week, one month and one year previous.

Jan. 3, Dec. 27, Dec. 6, Jan. 4,
1906. 1905. 1905. 1905.

PIG IRON:

Foundry No. 2 Standard, Philadelphia	\$18.50	\$18.25	\$18.25	\$17.50
Foundry No. 2 Southern, Cincinnati	16.75	16.75	16.75	16.25
Foundry No. 2, Local, Chicago ..	19.25	19.25	19.25	17.50
Bessemer, Pittsburgh	18.35	18.35	18.35	16.85
Gray Forge, Pittsburgh	17.25	16.85	17.10	15.85
Lake Superior Charcoal, Chicago	20.00	20.00	20.00	18.50

BILLETS, RAILS, &c.:

Bessemer Billets, Pittsburgh...	26.00	26.00	26.00	22.00
Forging Billets, Pittsburgh...	30.00	30.00	30.00	25.00
Open Hearth Billets, Phila....	30.00	30.00	30.00	...
Wire Rods, Pittsburgh	33.00	32.50	32.50	31.00
Steel Rails, Heavy, Eastern Mill	28.00	28.00	28.00	28.00

OLD MATERIAL:

O. Steel Rails, Chicago	16.50	16.50	16.50	16.00
O. Steel Rails, Philadelphia ..	18.25	18.25	18.25	17.25
O. Iron Rails, Chicago	23.00	23.00	23.00	22.25
O. Iron Rails, Philadelphia ..	24.50	24.50	24.50	20.50
O. Car Wheels, Chicago	19.00	19.00	18.00	16.75
O. Car Wheels, Philadelphia ..	18.75	18.75	17.50	15.25
Heavy Steel Scrap, Pittsburgh..	17.50	17.50	18.00	16.50
Heavy Steel Scrap, Chicago	15.00	15.00	15.25	15.00

FINISHED IRON AND STEEL:

Refined Iron Bars, Philadelphia.	1.93½	1.83½	1.83½	1.63½
Common Iron Bars, Chicago....	1.85	1.85	1.85	1.65
Common Iron Bars, Pittsburgh.	1.90	1.90	1.90	1.69½
Steel Bars, Tidewater, New York	1.64½	1.64½	1.64½	1.54½
Steel Bars, Pittsburgh	1.50	1.50	1.50	1.40
Tank Plates, Tidewater, New York	1.74½	1.74½	1.74½	1.64½
Tank Plates, Pittsburgh	1.60	1.60	1.60	1.50
Beams, Tidewater, New York...	1.84½	1.84½	1.84½	1.64½
Beams, Pittsburgh	1.70	1.70	1.70	1.50
Angles, Tidewater, New York...	1.84½	1.84½	1.84½	1.64½
Angles, Pittsburgh	1.70	1.70	1.70	1.50
Skelp, Grooved Steel, Pittsburgh	1.55	1.55	1.55	1.45
Skelp, Sheared Steel, Pittsburgh.	1.65	1.65	1.65	1.50

SHEETS, NAILS AND WIRE:

Sheets, No. 27, Pittsburgh	2.20	2.20	2.20	2.20
Wire Nails, Pittsburgh	1.85	1.80	1.80	1.75
Cut Nails, Pittsburgh	1.75	1.75	1.70	1.75
Barb Wire, Galv., Pittsburgh...	2.30	2.25	2.25	2.20

METALS:

Copper, New York	19.25	19.00	18.00	15.12½
Spelter, St. Louis	6.50	6.50	6.40	6.00
Lead, New York	5.95	5.95	5.90	4.60
Lead, St. Louis	5.90	5.80	5.75	4.52½
Tin, New York	36.05	35.90	35.10	29.05
Antimony, Hallett, New York...	13.75	13.00	13.00	8.75
Nickel, New York	40.00	40.00	40.00	40.00
Tin Plate, Domestic, Bessemer, 100 pounds, New York	3.59	3.59	3.59	3.74

Chicago.

FISHER BUILDING, January 3, 1906.—(By Telegraph.)

Increased activity is noted, notwithstanding the holiday season. Large contracts for the heavier forms of Finished Iron and Steel were placed during the closing days of the year, while the demand for Pig Iron revived and the tonnage placed was considerably above the normal average. Rail orders booked by the Illinois Steel Company aggregate 50,000 tons and the month's total was approximately 140,000 tons. Heavy contracts for Plates and Structural Shapes were placed by bridge builders, car shops and large distributors for delivery through the first half of the year. The demand for Track Supplies continues unabated and Spikes have again been advanced. The Bolt and Spike works of the Illinois Steel Company are now almost booked through the entire year, and a proportionately large tonnage of Splice Bars has also been taken on. The Steel shortage in the West promises to become acute when the new Structural mill of the Illinois Steel Company is operating in full. That the Steel requirements of this mill will greatly curtail the supply for outside consumption is certain, but to what extent is not yet definitely known and cannot be stated until the company's new Open Hearth plant is in operation. The revival of the demand for Pig Iron found the Northern market strong, with the tendency toward higher prices, while on the other hand it was found that \$14.25 could readily be done on Southern No. 2 for future delivery, notwithstanding the sales that have been made at \$15 to meet prompt requirements. As yet no cancellations have been received of Rail and rolling stock contracts from the

Walsh railroads, although there is every probability that the work will be delayed.

Pig Iron.—Notwithstanding the holiday week the demand improved materially and sales easily aggregating 10,000 tons were reported. The bulk of the tonnage was placed with Northern furnaces by Malleable interests and as a result of the week's transactions the Northern market shows an advancing rather than a declining tendency. Southern Iron quotations cover a wide range. We note the sale of a small lot of No. 2 for immediate delivery at \$15, Birmingham, while on future deliveries \$14.25 is quoted by a number of interests.

Billets.—While the needs of the large Western consumers of Axle and Forging Billets will be taken care of during the next few months expiring contracts will not be renewed by the leading interests until it is definitely known what tonnage will be required to meet the demand of its increased finishing capacity. Forging and Axle Billets in small lots for prompt delivery are quoted at \$35, f.o.b. mill, Chicago.

Rails and Track Supplies.—During the past week the Illinois Steel Company booked orders for 50,000 tons of Standard Section Rails, making the total for the month approximately 140,000 tons. These contracts were accompanied by heavy orders for Track Supplies, and the Joliet Works has orders booked for Spikes and Track Bolts running almost through the entire year. Spikes have been advanced to a minimum of 2c. in large lots, and on broken car lots an advance of \$2 is asked.

Structural Steel.—The Steel requirements for the new building to be erected by the Commercial National Bank, aggregating 7000 tons, were contracted for with the American Bridge Company nearly four months ago, although the permit for the erection of the building was only issued last week, and the work of erection will not begin until June. Deliveries were thus insured at a favorable price and a situation such as confronts the country in the erection of the new building was obviated. Bids for furnishing the Steel for the latter have again been asked for, and if anything higher prices than before will be quoted. Structural building shops have placed heavy contracts with the mills for future requirements and a large tonnage was also booked from a Western distributor.

Plates.—The Plate tonnage closed by the Illinois Steel Company last week was greater than that entered during any similar period in the year, bridge builders and car works figuring as the largest purchasers, while Western jobbing interests placed round tonnages to cover future requirements.

Bars.—Steel Bar specifications continue greatly in excess of mill shipments, and Iron mills that are in position to make fairly prompt deliveries are taking on considerable tonnage from Steel Bar consumers at prices considerably higher than those prevailing for Steel.

Sheets.—Mills are very busy and are somewhat indifferent about taking on new tonnage. The high prices prevailing for Spelter make it almost impracticable for the mills to produce Galvanized Sheets at present figures and but little disposition is shown to take contracts.

Merchant Pipe.—Notwithstanding the comparatively small tonnage that usually reaches the mills at this season of the year prices lower than existing official discounts have been reported during the week and 81 off the list at Pittsburgh has again been done. Official discounts are unchanged.

Boiler Tubes.—There is little change in the situation, and sales are almost entirely limited to small lots from jobbers' stocks. Prices are fairly well maintained.

Cast Iron Pipe.—Foundries are now accumulating stocks for the spring and summer demand. Despite negotiations that are on in the East for large tonnages Western municipalities have not yet made up their requirements for 1906.

Merchant Steel.—Heavy specifications continue to be received from vehicle and implement manufacturers. The new business that is being placed is limited almost entirely to small lots for immediate delivery, but as specifications on old contracts are in excess of mill shipments this lack of new tonnage is no criterion of any falling off in consumption.

Coke.—High grade Connellsville Foundry Coke on contracts running through the first three months of the year is quoted at \$3.50, but other Pennsylvania grades can be had as low as \$3 to \$3.25 at the ovens. By-product Coke, which usually sells in Chicago on the same basis as high grade Connellsville Coke, is now quoted at an advance of 25c. a ton for delivery extending through the first six months of the year. Large consignments of Connellsville Coke continue to come into this market and are disposed of at prices ranging from \$5.65 to \$5.90 for prompt delivery. By-product Coke, on the other hand, is quoted at \$6.40.

Old Material.—The market generally continues weak, but no price changes have been recorded in the absence of transactions. Only one railroad list has come out and that has been by the Chicago, Burlington & Quincy, covering a total of 1000 tons. It has been learned that other roads

are withholding their material until market conditions are firmer and better prices prevail.

Pittsburgh.

PARK BUILDING, January 3, 1906.—(By Telegraph.)

Pig Iron.—While the market is quiet prices are very firm, with most of the furnaces well sold up for January and February and in some cases for a longer period. The United States Steel Corporation has not yet bought its Iron, but may do so before this week is out. It is said that two leading producing interests have less than 30,000 tons of Bessemer Iron for January delivery. We quote Bessemer at \$17.50 and Basic at \$17.25, Valley furnace. We note sales of about 3000 tons of Bessemer for first quarter at \$17.50 at furnace. There is not much inquiry for Foundry Iron, but it is expected that during this month some large consumers will come into the market. We quote Northern No. 2 Foundry at \$17.50, Valley furnace, or \$18.35, Pittsburgh, and note sales of about 500 tons at that price. There is some inquiry for Forge Iron and prices are firm, Northern Forge being held at \$16.40 to \$16.50, Valley furnace, or \$17.25 to \$17.35, Pittsburgh. We note sales of about 2500 tons of Forge for forward delivery at \$16.40 to \$16.50, Valley furnace.

Steel.—There is not much inquiry for Steel, but prices continue very strong, Bessemer and Open Hearth Billets being held at \$26, Pittsburgh, and Sheet and Tin Bars, in random lengths, at \$27, maker's mill. The scarcity in supply of Sheet and Tin Bars will soon be relieved to some extent, as the Bessemer plant of the Republic Iron & Steel Company and the Ohio works of the Carnegie Steel Company, both at Youngstown, are now running on that class of product.

Correction.—The report published last week that the Lackawanna Steel Company had bought 25,000 tons of Bessemer Pig Iron and is in the market for more proves to be untrue.

(By Mail.)

The opening of the new year finds splendid conditions prevailing in practically all branches of the Iron and Steel trades and the outlook could hardly be more promising. The tremendous pressure on the mills to get out product was clearly shown by the short shut down on the Christmas and New Year holidays, most of the plants closing only on those two days. The Pig Iron market has been quiet in the past week, but prices continue very firm. Only a minimum tonnage of Bessemer Iron is available for the first month or two of the year. Tonnage in Finished Iron and Steel continues heavy, at least part of the large demand being due to the favorable weather. Prices are very firm and Wire products, Sheets, Tin Plate and Tubular goods may be advanced before long.

Steel Rails.—The Carnegie Steel Company has been a heavy purchaser of Old Steel Rails for rerolling purposes, which it will reroll in its No. 3 Rail mill at the Edgar Thomson works. Contracts for Standard Section Rails placed since our last report amount to fully 100,000 tons and some large tonnage is pending. Light Rails have been advanced about \$1 a ton, and we now quote as follows: 8-lb., \$36; 10-lb., \$32; 12-lb., \$30; 16-lb., \$29; 20-lb., \$28.50; 25 to 45 lb., \$27.50 to \$28, maker's mill.

Rods.—The mills now quote \$33 to \$34 for Bessemer and Open Hearth Rods, and we are advised that some makers will not shade the higher price. Open Hearth Chain Rods are still quoted at \$33, maker's mill.

Skelp.—The mills rolling Skelp continue very much behind on deliveries and prices remain very firm.

Plates.—New tonnage in Plates has fallen off considerably, and the mills are now catching up to some extent on delayed deliveries. Specifications on contracts continue heavy and shipments by the mills in December were unusually large for a winter month.

Structural Material.—A very large amount of work is in sight, including 75,000 tons or more of bridge work which is expected to be placed very shortly. The leading Structural interests are covered with work for the next six months or longer. Prices are very firm.

Sheets.—The current demand is fairly large and is reported to be much heavier than usual at this season of the year. Deliveries of Sheet Bars are still unsatisfactory and all mills are having more or less trouble in getting them as fast as needed. Prices are firm.

Tin Plate.—The demand continues unusually heavy for this season and some mills are asking slight premiums in prices for prompt shipments.

Merchant Steel.—In the past week or two some heavy contracts for Cold Rolled Shafting have been placed by large consumers for delivery through the first half of the year and in some cases through all of the year.

Railroad Spikes.—Current tonnage is fairly large, the favorable weather allowing track laying to go ahead with-

out interruption. We quote at \$2 to \$2.05 per 100 lbs., maker's mill.

Merchant Pipe.—December tonnage was quite satisfactory, and while prices are reported generally firm there are as yet no indications of an advance. With the high prices ruling for Steel and Skelp, Pipe is the cheapest article on the whole list.

Boiler Tubes.—New demand is quiet, this being the off season in the Boiler Tube trade, and concessions in prices are being made.

Iron and Steel Scrap.—Very little tonnage in Scrap has been placed for the past two weeks or more, but with a resumption of operations by the mills the demand is expected to show betterment soon.

Coke.—The heavy output and full supply of cars have brought about lower prices and strictly Connellsville Furnace Coke can be bought at \$2.75 a ton at oven. We note a sale of 100 cars for January shipment at this price. Connellsville 72-hour Foundry Coke is held at about \$3.50 a ton at oven.

Philadelphia.

REAL ESTATE TRUST BUILDING, January 2, 1906.

Notwithstanding the great activity the last months of 1905 the Christmas and New Year holidays appear to have made very little difference, as 1906 begins without any of the evidences of quietness and apathy which usually develop during the first month of the year. It is in fact surprising how much business was done during the last week of 1905, while the indications of similar activity during the first week of 1906 are equally favorable. It is also to be noted that prices are stiffening, the inside figure of No. 2 X Foundry having been advanced 25c. per ton and of Gray Forge 25c. to 50c. per ton. The fact that orders are promptly placed at the advanced figures is convincing proof of the strength of the market, and is also good evidence of the extraordinarily heavy requirements of consumers. When this has been said and considered there is really no necessity for further discussion, unless it may be as regards the ability of producers to meet the demands that will be made on them. For several weeks mills have been on the edge of a famine, but the open weather has been a great help, as there has been practically no hindrance to transportation, thus enabling most of the furnaces to do their best work at a time of year when they usually meet with interruptions. The weather is really a very important factor, and will exercise considerable influence during the next two or three months. At the moment prospects indicate that production during 1906 will be the largest on record, but in view of the small quantity on hand and the assured heavy requirements of consumers this is regarded as a favorable feature rather than otherwise. The danger of a shortage will be lessened, while prices will be less liable to fluctuation and the danger of imports sensibly decreased.

Pig Iron.—Quite a large business was done last week and some very nice orders were placed during the first business day of the new year. It may indeed be said that the opening of 1906 is the most auspicious that the Iron trade has ever known. Conditions appear to be so absolutely safe and confidence so firmly established that it is taken for granted that everything will be clear sailing, with no interruptions likely to cause any serious setbacks. One of the best features is the steadiness of prices. There is virtually no speculation in Iron, and while it is quite possible that prices may go higher consumers are giving themselves very little trouble about it. What they are after is to make money in their legitimate business, and if prices are going higher they are willing to pay the advance rather than by speculating in futures to help them out. This prevents inflation in prices and also insures steadiness for a long time to come. One of the most interesting developments of the times that the past two years has shown is that the largest business the world has ever known can be done within a range of prices not exceeding \$4 per ton, the larger portion having been done within fluctuations of \$1 to \$2.50 per ton. So far as prices are concerned in this territory they may be quoted strong at the following revised figures, delivered in buyers' yards:

No. 1 X Foundry.....	\$19.00 to \$19.50
No. 2 X Foundry.....	18.50 to 18.75
No. 2 Plain.....	17.75 to 18.25
Standard Gray Forge.....	16.50 to 17.00

Other grades are selling at the prices quoted last week.

Finished Material.—There is no change in prices, but the year begins with a good inquiry at the full figures quoted a week ago. It would be difficult to place orders for best Refined Bar Iron at less than 1.93½c., at which some good business has been done during the past few days. Plates and Structural Material are in good demand and the general outlook could hardly be better than it is at the present time. Mills in all lines are very full of orders and specifications

are sent in with unusual promptness, showing that a large consumption is in progress.

Old Material.—Prices are unchanged.

Robert Cabeen Lea, son of Ellis Lea, has been admitted as a member of the firm of J. Tatnall Lea & Co., with offices in the Stephen Girard Building, 19 South Twelfth street, Philadelphia.

Cleveland.

CLEVELAND, OHIO, January 2, 1906.

Iron Ore.—The figures are unusually late coming in showing the amount of Ore on Lake Erie docks at the conclusion of the season. The estimates to date are that of the 33,476,904 tons shipped from the head of the lakes about 30,000,000 tons came to port along the south shore of Lake Erie. This shows an increase in the amount received at Lake Erie of about 11,000,000 tons. The comment made upon this showing is that the increased consumption of the year was mainly at points contiguous to the south shore of Lake Erie, while the shipment to southern Lake Michigan points is almost stationary and has been so for several years. It is shown also that approximately 6,000,000 tons remains on Lake Erie merchant docks at the end of the year, which is an increase of only about 1,000,000 tons over 1904. This shows very plainly that the movement for the season was almost entirely direct from the boats to furnace yards. This is due to the increased number of furnaces taking Ore and to the better facilities afforded by the railroads for the handling of Ore from the lakes to the furnaces. These conditions also go far toward giving assurance that the increased movement of Ore is not a temporary spurt. Shippers and vessel owners are counting upon the necessity of beginning the movement of Ore as early in the season as the opening of the lakes will permit. The prospect of an early opening of navigation is not reassuring, unless compromises are made and the threatened labor trouble is averted. No new Ore sales of importance are reported, but prices hold steady. Quotations are as follows for base Ores: Old Range Bessemer, \$4.25; Mesaba Bessemer, \$4; Old Range non-Bessemer, \$3.70 to \$3.75, and Mesaba non-Bessemer, \$3.40 to \$3.50, all f.o.b. Lake Erie ports. The rates of transportation also remain unchanged, at 75c. from Duluth to Ohio ports, 70c. from Marquette and 60c. from Escanaba.

Pig Iron.—The announcement is made that the new Genesee furnace of Corrigan, McKinney & Co., at Charlotte, N. Y., will be blown in this week. It will run on Foundry Iron, producing about 300 tons a day. The same firm has given a contract for the construction of a new furnace at Scottdale, Pa. This will have a capacity of about 350 tons of Foundry Iron a day. Inquiries in the past few days indicate that buyers are again in the market. The Valley basis is \$17.50 to \$18 for No. 2. Southern furnaces are selling No. 2 at \$14.50, Birmingham. On future delivery there is a disposition to contest present prices, but producers are not disposed to make any concessions. It is possible, therefore, that general forward buying will wait for a while. Some sales of Basic have been made, delivery in the second quarter of the year, at \$18 in the Valleys.

Finished Iron and Steel.—Some relief has come to the Billet situation by the return to the market of some mills that withdrew late last year, but the demand is so strong that the increased supply scarcely makes any difference. Sales agents are just now able to place some orders which have been waiting on their books for weeks. Forging Billets sell at \$33 to \$35, Cleveland, for prompt delivery, while Bessemer 4 x 4 Billets for rolling are still \$30 to \$32, Cleveland. The mills will not be in position to entertain new contracts for some months. In Structural Steel the demand for boats is adding more tonnage. Two new ship contracts are pending, which will be closed, it is expected, before the week is out. Cleveland building prospects for the year are encouraging. Some new factories are to be built and a number of new large office buildings. These demands, together with the need for new bridges, promise a continuance through the year of the present enormous consumption of Structural Steel in this territory. It is now announced that numerous extensions of traction lines have been definitely provided for. One will be from Cleveland to Youngstown; another from Chippewa Lake to Mansfield. Other connecting links are to be built, the probable aggregate being about 200 miles of new line. Bars are strong. The smaller sizes of Steel Bars can be shipped with comparative promptness, but larger sizes are scarce. Prices hold at 1.50c., Pittsburgh. Bar Iron is firm, at 1.75c. to 1.80c., Youngstown. Sheets are in good demand. Most of the business is done out of stock on the old basis of 2.05c. for No. 10 Blue Annealed, 2.65c. for No. 28 One Pass Cold Rolled and 3.65c. for No. 28 Galvanized.

Old Material.—There is a disposition to resist the prices prevailing on Old Material. Consumers are buying only what they will need for the immediate future. The following represent dealers' prices to the trade, gross tons: Old Steel Rails, \$16.50 to \$17.50; Old Iron Rails, \$23 to

\$23.50; Iron Car Axles, \$16.50 to \$17.50; Heavy Melting Steel, \$16.50 to \$17.50. Net tons: Cast Borings, \$9.50 to \$10; No. 1 Busheling, \$15 to \$15.50; No. 1 Railroad Wrought, \$16.50 to \$17.50; Iron Car Axles, \$22 to \$23; No. 1 Cast, \$14 to \$15; Stove Plate, \$11; Iron and Steel Turnings and Drillings, \$11 to \$12.

Cincinnati.

FIFTH AND MAIN STS., January 3, 1906.—(By Telegraph.)

Pig Iron.—Reports show that sales made during the holiday week aggregated a larger tonnage than is usually the case. Iron on contracts is coming forward without unnecessary delay, so far as requests to hold shipments are concerned. The demand in the East appears to be more urgent than is the case locally, especially for the Steel making grades, prices showing considerable strength. Several of the large Pipe interests in the East are also said to have shown quite an interest in the market and during the past week or two have bought a large tonnage of various grades. The various selling agencies in this city have been asked by the United States Steel Corporation for prices on Basic covering the first quarter's delivery, but apparently there is a very limited amount offering. The inquiry from an Illinois car works noted in last week's issue was closed the latter part of the week by the purchase of probably 5000 tons of Virginia and Hanging Rock Irons. There is but one large inquiry in the market to-day, and that comes from a Northern Pipe maker who wants 18,000 tons of Ngs. 2, 3 and 4, both Northern and Southern, delivery to be made at the rate of 1500 tons per month running through the year. Prices are the same as quoted last week.

Coke.—Shipments are said to have been rather light during the week. There is still trouble in securing the requisite number of cars in the Virginia field, but this has been relieved to some extent in the Connellsville district.

Finished Iron and Steel.—The week has been comparatively quiet so far as new business is concerned, but this is without any significance, as mills are running to full capacity and have business enough to carry them well into the year.

Old Material.—The lull incident to the season has been more or less felt. Dealers, however, anticipate a good month's business.

Birmingham.

BIRMINGHAM, ALA., December 31, 1905.

Pig Iron.—With little Iron to sell and the holiday spirit prevailing it was expected that but little activity would be manifested this week. The operators and operatives have both been enjoying a rest preparatory to starting into the new year with a determination to accomplish greater things. One company reports a sale of 3000 tons of Forge to the United States Steel Corporation and another that it closed more contracts last week than during the three preceding weeks of December. These, however, were from regular customers and on quotations previously made for first quarter delivery. The buyers were delaying, thinking the inactivity might have a tendency to weaken the market, but finally closed at prices prevailing a month previous. The market is firm at \$14.50 for No. 2 Foundry, and as it is very sensitive it is probable that any concerted buying movement would cause an advance. The operators are entirely satisfied, however, with the present price, as there is a handsome margin of profit in it.

The retiring directors of the Tennessee Coal, Iron & Railroad Company have issued a statement that they are producing Iron at \$6.20 a ton, and while it is a well-known fact that Iron can be made more cheaply here than in any other part of the world it is costing other furnaces in the district from 40 to 50 per cent. more than these figures. Even at this cost, however, it would still leave more than 50 per cent. profit for the furnacemen, a condition of affairs calculated to satisfy almost any stockholder.

Practically all the manufacturing plants in the district have been closed down for the week, the men absolutely refusing to work during the holidays. Before this year a furnace was never known to bank over the holidays, but as during the past year wages have been higher and the people consequently more prosperous, they demanded an entire week instead of the usual one or two days' suspension.

Many rumors of extensive developments to be made by both new and existing companies during the year 1906 are heard on every side, but nothing sufficiently tangible for publication. A number of Northern and Eastern capitalists have spent much time here recently conferring with local leaders, and if plans now under way are consummated an interesting announcement of new developments in the Birmingham district can be made shortly, which premature publication might seriously affect.

Cast Iron Pipe.—Inquiries this week have been more numerous than for some time past, and while none are very

large, taken together they make considerable tonnage. The shops are working on old orders, some of them having their output booked for six months and more and are not in position to quote. Following are conceded to be prevailing prices on Water Pipe per gross ton:

4 to 6 inch.....	\$26.00
8 to 10 inch.....	25.00
12 to 20 inch.....	24.00
24 to 48 inch.....	23.00
Gas pipe, \$1 extra.	

Old Material.—The week has been unusually quiet, pending a resumption of work at the mills consuming Scrap. Quotations are approximately as follows per gross ton, f.o.b. cars here:

Old Iron Rails.....	\$21.50 to \$22.00
No. 1 R. R. Wrought.....	19.50 to 20.00
No. 2 R. R. Wrought.....	18.00 to 18.50
No. 1 Country Wrought.....	17.00 to 17.50
No. 2 Country Wrought.....	16.50 to 17.00
Wrought Pipe and Flues.....	14.00 to 14.50
Mixed Steel.....	13.00 to 13.50
No. 1 Machinery Cast.....	12.00 to 12.50
Stove Plates and Light Cast.....	10.50 to 11.00

New York.

NEW YORK, January 3, 1906.

Pig Iron.—There is a healthy demand for Foundry Iron for prompt delivery, but no particularly large transactions have been closed. The Steel Corporation is at this writing closing for the supply of Basic Pig Iron for the Eastern works for the whole of the first half. The exact tonnage has not yet been announced. The leading makers of Foundry and Forge Iron in the Schuylkill and Lehigh valleys have advanced prices 25c. per ton. We quote Northern Iron No. 1 Foundry, \$19 to \$19.25; No. 2 Foundry, \$18.50 to \$18.75, and No. 2 Plain, \$18.25 to \$18.50, tidewater. Southern Iron is selling at \$18.75 to \$19 for No. 1 Foundry and \$18.25 to \$18.50 for No. 2 Foundry.

Steel Rails.—The most important new contract of the past week was that of the Oklahoma Central for 15,000 tons. The Toledo & Ohio Central bought 2000 tons, and for various frog and crossing manufacturers and trolley lines the total was 15,000 tons. The Baltimore & Ohio business definitely placed for 1906 amounts to 71,000 tons. The Vanderbilt lines, whose wants were scheduled some time ago, have actually taken 73,000 tons for this year, but considerably more will be used. It is now authoritatively estimated that upward of 2,000,000 tons of Rails have been booked for 1906, exclusive of business that will have to be carried over from this year because deliveries could not be made.

Structural Material.—The American Bridge Company's compilation of its business statistics for the year 1905 shows the bookings to have been 540,000 tons, an unprecedented record. The company considers 40,000 tons a month a very good average, but the past year's average has been 45,000 tons. Just at the end of the year this company closed 20,000 tons of Northern Pacific bridge business, the bulk of this material being required for the bridges over the Columbia and Willamette rivers, the former of which is more than 2000 feet long, having eight spans and a draw. The greatest year for the American Bridge Company preceding 1905 was 1901. The outlook for the new year is full of promise and to-day a large number of railroad and highway bridges and Steel frame buildings are being figured on. The Cook County (Ill.) Court House is to be figured on again, presumably after a revision of plans, as lower prices for Steel are not to be expected. Importation of Structural Steel has continued in a moderate way, about 20,000 tons of Shapes for this country having been booked in the past six weeks, making a total of 60,000 tons since early fall, in addition to what was taken by Belgian mills. The price has been advanced, the German syndicate now quoting £6, c.i.f. New York. With duty added this figures out about 1.80c., as against 1.84½c. for domestic Shapes. The German mills are filling up and are now unable to deliver on new business short of the second quarter. Some of the American business recently taken calls for deliveries extending into the third quarter of the year.

Plates and Bars.—That the Plate trade is not only in first-class condition but that prospects are brighter than ever is indicated by the advance of \$2 per ton on Heavy Plates and \$5 per ton on No. 10 by one of the largest Eastern companies which was put in effect this week. Bars are firm at previously quoted prices.

Cast Iron Pipe.—From present appearances it is believed that the entire contract for 30,000 tons of Water Pipe for the high pressure service in this city will go to R. D. Wood & Co., Philadelphia. The Warren Foundry & Machine Company secured the contract for 8000 tons for Richmond Borough (Staten Island), placed last Thursday. Another large quantity of Pipe will shortly be called for by the New York gas companies. Inquiries continue so numerous that the expectation is entertained that an unusually heavy amount of buying is still to occur long before spring opens. Prices are very firm, with carload lots of 6-inch Pipe quoted at \$29.75 per net ton at tidewater.

Old Material.—Old Car Wheels have been the strongest article in the list of Old Material, the transactions being quite numerous, with one sale reported of 1000 tons. Cast Scrap is also very strong, corresponding with the strength of the Pig Iron market. Sales include 1000 tons of Heavy Cast and 500 tons of Stove Plate. No. 1 Railroad Wrought holds its own, notwithstanding the efforts of some large consumers to force prices lower, and the last railroad list is reported to have sold at \$22.50 to \$22.75, eastern Pennsylvania. Yard Wrought Scrap is quiet. Borings and Turnings are fairly active and selling at good prices. Wrought Pipe is in reasonably fair demand, although but little is to be had in this vicinity. Steel Scrap and Old Steel Rails are strong. Inquiries that have been in hand for the past 30 days have not yet been filled, one large buyer being in the market who would take about 5000 tons per month for three months. Iron Car Axles are still in strong demand at full prices. The unusually open winter has had a great deal to do with keeping down prices on Scrap, as the railroads have been gathering and shipping a great deal of material. The general condition of the Scrap market, however, is very encouraging, and it is expected that before the middle of this month the demand will so increase that prices will be considerably higher by the middle of February. Dealers are looking forward to a banner year in this branch of trade. Prices are unchanged from those quoted last week.

Metal Market.

NEW YORK, January 3, 1906.

Pig Tin.—Strength characterizes the opening of the year, as on Tuesday a very good business was done at quotations approximately 40 points higher than Friday's business. The statistics which were issued Tuesday were decidedly favorable to the holders of the metal, and competent judges express the belief that the metal is bound to go higher. To-day's London market closes at £163 for spot and £163 17s. 6d. for futures. This is the first instance in a long time that futures have been quoted at a premium over spot, and denotes a very strong position in the metal. To-day's local market is firm and higher with sales ranging at about 36,05c.

Copper.—Advanced quotations mark the beginning of the new year. For spot January and early February delivery the prices range from 19¼c. upward for Lake and Electrolytic, premiums varying according to brand of metal and urgency of the need. For shipment during the latter part of February, March and April 18¾c. to 19½c. is asked. For later shipment 18½c. is quoted. We have it on excellent authority that a firm of English wire drawers has purchased Electrolytic Copper for January delivery at £90. This would be equivalent to practically 19.40c., c.i.f. New York.

Spelter.—The Spelter market is very dull, there being no pressure to sell, while buyers are inclined to await future developments. In the New York market Spelter is held at 6.50c. to 6.60c. In St. Louis the market is quiet and firm at 6.50c.

Pig Lead.—The market is rather dull, but there is a tendency to weakness caused by the large amount of unsold imported Lead. This Lead is now for sale at 5.95c. and there appear to be no takers at this price. In St. Louis the market is very firm at 5.90c. The American Smelting & Refining Company continues to quote shipment Lead in 50-ton lots at 5.60c., but is accepting orders only at the price current on date of shipment.

Antimony.—The market is very firm and has advanced. Cookson's and Hallett's are now held at 13.75c. to 14.50c.; other brands at 13.25c. to 14c.

Tin Plate.—Deliveries continue to be from six to eight weeks behind the usual expectations, and in some instances premiums are offered for prompt shipment. The price continues to be firmly maintained on a basis of \$3.59, f.o.b. New York, or \$3.40, f.o.b. Pittsburgh.

Old Metals.—Dullness characterizes this market which is chiefly caused by the inability of dealers to secure any large amount of metal. Copper is particularly hard to obtain, and at the present quotation is eagerly sought for by dealers and manufacturers.

Iron and Industrial Stocks.

NEW YORK, January 3, 1906.

The stock market was exceedingly active and prices of iron and steel stocks particularly were very strong during the week under review notwithstanding the high rates prevailing for money. On Thursday the rate on call money was reported to have reached as high as 125 per cent., which under ordinary circumstances would have precipitated a panic, but speculation in stocks continued with unabated vigor. In some cases the highest price on iron and steel stocks was reached during the closing days of last week, but in other instances, notably the United States Steel stocks,

the highest point was reached on Tuesday. On the latter day United States Steel preferred sold up to 107¼, which is its record price, and the common stock touched 43¾, the highest price attained on this movement. On Tuesday also American Locomotive common sold up to 78, which is a great jump from last Thursday when it sold at 67. On Friday and Saturday Colorado Fuel sold up to 57½, and on Friday Republic preferred reached 107½ and the common touched 35. The highest price reached during the week on Car & Foundry common was 41½, Steel Foundries preferred 52, Pressed Steel common 55¾, Railway Spring common 61½, Tennessee Coal 133, Cast Iron Pipe common 47½ and on the preferred 95%. Last transactions up to 1.30 p.m. to-day were made at the following prices: Can common 9½, preferred 69½; Car & Foundry common 40, preferred 99¾; Locomotive common 77¼, preferred 117¼; Steel Foundries common 14½, preferred 50½; Colorado Fuel 56½; Pressed Steel common 55¾, preferred 100; Railway Spring common 62; Republic common 33¾, preferred 106¾; Sloss-Sheffield common 87¾; Tennessee Coal 131½; United States Cast Iron Pipe common 46½, preferred 94¾; United States Steel common 43¾, preferred 106¾.

Harvey Fisk & Sons of New York are offering at 96¼ and accrued interest \$4,500,000 first mortgage 5 per cent. bonds of the Railway Steel Spring Company issued to finance the purchase of the plant of the Latrobe Steel Company. J. E. French, president of the Railway Steel Spring Company, states that the average annual net earnings of the Latrobe Company during the past ten years amount to more than \$500,000. The annual capacity of the plant heretofore has been about 36,000 tons. Extensive improvements are now under way which will increase it to about 90,000 tons. The bonds are to be secured by a first mortgage on the Latrobe property and by an annual payment of \$135,000 into a sinking fund. The bonds are redeemable at 105.

Net earnings of the Cambria Steel Company for 1905, partly estimated, were \$3,800,000, against \$1,925,542 in 1904. The earnings for 1905 were the largest of any year since 1902, when the additional capital was issued, raising the amount of the outstanding stock from \$15,000,000 to \$45,000,000. The earnings on the stock were substantially 8 per cent. in 1905, 3.9 per cent. in 1904, 6.6 per cent. in 1903 and 9.6 per cent. in 1902. Out of the surplus large amounts have been devoted to improvements.

The American Car & Foundry Company makes the following report of its operations for the quarter ending October 31, 1905:

Net earnings.....	\$717,739.20
Dividend on preferred stock.....	525,000.00
Surplus.....	\$192,739.20
Former surplus.....	12,505,746.08
Total surplus, not including November and December earnings.....	\$12,698,485.28

Dividend.—La Belle Iron Works, Steubenville, Ohio, has declared a quarterly dividend of 2 per cent., payable February 1, an increase of one-half of 1 per cent. over the previous rate.

Railroad Building in 1905.—The figures compiled by the *Railway Age* show that 4979 miles of new track was laid in 1905 on 337 lines in 45 States and Territories. In addition several hundred miles have been graded and track is now being laid on many lines. Some roads had not reported when the statistics were made up and it is estimated that the complete returns will show over 5000 miles. Slow progress was made in the first half of the year, only 1284 miles of track being reported up to July 1, 1905. The record of new track laying in the years from 1887 to 1905, inclusive, as given below, shows that in only seven out of 18 years has the new construction exceeded that of 1905:

Year.	Miles.	Year.	Miles.
1887.....	12,983	1897.....	1,880
1888.....	7,106	1898.....	3,083
1889.....	5,230	1899.....	4,588
1890.....	5,670	1900.....	4,437
1891.....	4,281	1901.....	5,222
1892.....	4,192	1902.....	5,684
1893.....	2,635	1903.....	5,786
1894.....	1,949	1904.....	4,252
1895.....	1,803	1905.....	4,979
1896.....	1,848		

Poor's Manual gives the railroad mileage in the United States on January 1, 1905, as 212,349 miles. On January 1, 1906, it was about 217,350 miles.

The total fire losses of the past year are estimated at about \$175,000,000, as compared with \$252,364,050 in 1904 and \$156,195,600 in 1903. The great Baltimore fire occurred in 1904.

The Machinery Trade.

Bright Prospects for the New Year.

NEW YORK, January 3, 1906.

In contrast to the previous year 1905 early developed a marked activity among buyers and machinery merchants were much gratified at the quick materialization of the large projects which had been "hanging fire" for some time. From the start of the upward trend of business all indications pointed to a heavy volume of transactions, prosperity was visible throughout the country and the large corporations which consume great quantities of mechanical equipment were taking off their coats preparing to exert themselves to supply the demand that was then beginning to grow at a rapid pace. As the year wore on the demand increased and manufacturers began to expand to secure the needed enlarged facilities. Large extensions were made to their plants and some of the important companies purchased outright completely equipped works or built new ones. So large did the demand grow that during the last few months manufacturers even with the increased facilities found themselves unable to make reasonable deliveries running their plants full force double turn. The year was one of the most lucrative in the history of the machinery trade. The cause of this expansion of facilities was not so much the great number of extensive lists of machine tools provided for, but the very large and constant volume of small business which found its way into every office from all sections of the country, thereby giving a stability to trade and placing it on a firm basis. It is true that the railroads purchased heavily and some of the large corporations closed long lists, but the main portion was made up of a few machines here and a few there. One of the important features of the trade during the year was the general advance in prices on practically all classes of machine tools of from 5 to 10 per cent., which was made to cover the additional cost of manufacture of new designs of tools for high speed steel, motor drives and other special attachments and the higher cost of raw material. Manufacturers have been entitled to an advance for some time owing to the extra cost of production of an up to date tool. Another feature of importance was the combinations formed and the absorption of rivals by some of the largest of the machinery houses.

At the close of the year we find most of the work that was early planned or that had been held in abeyance for some time completed, and in every case where it was possible the machinery specifications have been closed by the purchasing agents. Much of the equipment contracted for will not, however, be delivered for a month or two, as machine tool builders are several months behind in deliveries. This has an important bearing on the trade of the first quarter of the new year in that the wheels of industry already have enough power behind them to keep them humming. The year 1906 opens most auspiciously for a long continuation of a profitable and good business and with good prices prevailing. Among corporations which are usually looked upon as heavy consumers of machinery many are planning the consummation of large projects this year. The railroads contemplate the expenditure of millions of dollars for improvements, which will include the purchase of mechanical equipment aggregating an enormous amount of money. Owing to the tremendous traffic of the past year they have been compelled to increase their rolling stock, and as a consequence will need more shop room and equipment to keep it in order. Yard facilities will also have to be extended. The two late developments in railroading—electrification and the use of steel passenger cars—are justly looked upon as requiring the attention of machinery merchants before many moons shall have passed. Several of the large railroads are preparing for the electrification of parts of their systems for suburban travel, on which work will start at an early date. Industrial enterprises are showing signs of further material expansion. Conservative business men predict that there will be a very large demand for machinery this year and that the main difficulty will be to get deliveries, which are now several months behind with chances of becoming extended. In other words, sales can be made if merchants can get the tools to sell. It will be remembered that the stocks in stores are practically cleaned up. These conditions have already benefited the trade in one way and will undoubtedly be of estimable value in that they will result in the early placing of large orders. Apprehensive of a long delay in delivery at least one of the large railroad systems has prepared an extensive list of machine tool equipment which is about ready for distribution. It is the general opinion in the trade that both railroads and large corporations will get lists of tools ready earlier than usual—in fact, as near the first of the year as possible—so that they can place contracts and get delivery in time to install the new tools as soon as they are needed. It will not be surprising to see the trade bidding on a larger number of specifications than usual the first few months of the year.

Purchases to Be Made by Railroads.

In contemplating the outlook for the new year, then, the first points to be considered are the programmes mapped out for early purchases, reconstruction and extension of works and the building of new plants. Of construction work a great deal has been projected for the coming year and will readily be found by a glance backward on the more important projects which have come to the general notice of the trade.

In connection with railroad work the most important, from the viewpoint of prospective purchases of mechanical equipment, are probably those planned by the Vanderbilt lines, more commonly spoken of as the New York Central lines, which include the New York Central & Hudson River, West Shore, Lake Shore & Michigan Southern and the Michigan Central railroads. During the past year these lines enormously increased their motive power equipment and added to their shops and yards. In that time upward of \$1,000,000 worth of machine tools alone were purchased. Even with this large amount of additional machine tool equipment the shops are wholly inadequate to take care of the necessary repairs and plans are being laid down to supply this deficiency. The officials of these lines have for a long time been preparing plans for extensive improvements in all of the mechanical departments and now these plans have matured to the point when they will become operative within a short time. To carry out their plans the lines will spend millions of dollars, a large part of which will be expended for mechanical equipment. It is the intention to bring the machinery equipment of the various shops up to date and to accomplish this the officials will expend about \$5,000,000 during 1906 for machine tools, which will be the biggest year of the lines in the way of machine tool purchases. As the New York Central Railroad's equipment is in poorer condition than that of the other roads it is likely that that road will receive the greater portion of the tools bought. The Central will make important improvements at West Albany, Buffalo, Peekskill, Mt. Vernon and White Plains, N. Y. In carrying out its scheme to electrify its road for suburban travel orders have been placed for a number of electric locomotives, and it is probable that the new buildings to be erected will include especially equipped shops to take care of its electrical equipment. In addition to tools the road will in all probability buy extensively of electrical equipment. In the spring work will be commenced upon the construction of a great freight receiving and distributing yard at Gardenville, just east of Buffalo, for which 1000 acres of land have been purchased. Next in importance in the way of mechanical requirements will be those of the Michigan Central Railroad for construction of its tunnel under the Detroit River. The West Shore Railroad will also likely come into the market for electrical equipment. It now has under way work of electrifying 81 miles of road between Rochester and Syracuse, which is expected to be in operation by next summer.

Although the Pennsylvania Railroad made enormous purchases of machinery the past year and completed extensive improvements the coming year will undoubtedly experience a continuation of the policy of expansion. Even from the improvements which have not yet advanced to the final stage of completion, but which were started some months ago, a handsome aggregate of machinery purchases is predicted. It is known that certain divisions have asked for large appropriations for improvements and that these are under advisement by the proper officials. When acted upon and the final plans approved some substantial lists will be issued. Aside from the tools required yearly for renewal much will be needed for new shops and additions. The Pennsylvania Railroad intends to electrify part of its system, announcement of such plans having already been made for some branches in New Jersey, while of course the tunnels in New York and vicinity are to be electrically operated. Not much has as yet been done by the road in the way of special machinery to make repairs to its electrical equipment, and in all probability its plans for new shops will include buildings especially designed for such work.

Especially interest is attached to the New York, New Haven & Hartford Railroad at this time in view of the fact that this road is expected to be one of the first to issue a long list of machine tools. It is understood that the specifications have been prepared and are ready for distribution. The tools are required for its new locomotive repair shops, which are to be erected at Readville, Mass., at an approximate cost of \$1,200,000. There will be two main buildings, one a machine, erecting, boiler and tank shop, which will be 150 x 900 feet, of steel frame and masonry construction. The repair kits on the erecting side of the shop run longitudinally with the shop, avoiding the use of transfer tables. Pits will be served with electric traveling cranes. The blacksmith shop will be 80 x 350 feet. There will also be erected auxiliary buildings in the shape of iron houses, coal houses, scrap bins, &c. Such tools as are in constant use will be grouped and each group will be driven by a motor. The tools which are used intermittently and require the service of electric cranes will be equipped with individual motors. The shops are de-

signed to repair 45 to 50 locomotives a month and will be electrically driven.

The most important improvement to be made by the Erie Railroad during the year will be at Jersey City, where all the necessary property has been purchased and which will cost in the neighborhood of \$10,000,000. While the plans for the new shops have not yet been completed, it is understood that the plant there will consist of machine shops, repair shops and other buildings. Beyond making repairs of a more or less unimportant nature to existing plants this is the only expenditure for new shop construction at present outlined by the railroad for 1906. Most of the money spent by the road during the year just ended was for cars and shop construction. It is estimated that more than \$100,000 was spent for machinery equipment alone for shops at Meadville, Huntington, Cleveland, Galion, Dunmore, Buffalo, Bergen, N. J.; Port Jervis, N. Y.; Rochester, Bradford, Pa., and at several other Pennsylvania and Ohio shops, in addition to the installation of an extensive power plant at Hornellsville. These improvements are now being finished and some of the money appropriated for 1905 has not been entirely expended, but will be spent during the next two or three months in finishing up the work outlined for last year. The company will pay particular attention to improving its grades this year. Work on the mile-long tunnel under Guinard Hill, between Middletown and Port Jervis, N. Y., will be pushed so that that project will be completed before the winter months are over. The Genesee Valley Railroad, which will give a practically sea level line between Cuba and Portage, N. Y., will be completed, and the Columbus & Erie road, which double tracks the main line between Columbus, Pa., and Jamestown, N. Y., will be finished. A million dollars was spent by the company during 1905 for bridges and there will be little of this work done during the coming year. Some improvements will be made at the terminal yards at Marion, Ohio, and Hammond, Ind. A new automatic signal will be installed by the New York division at the expense of \$225,000. While the question of electrifying the Erie Railroad's lines in and near New York is under consideration by that company, nothing definite has been decided upon in that way for the near future. The officers of the road say that the matter may be taken up before the year is out, but for the present attention will be paid toward improving the company's track system generally and obtaining better grades. That the Erie must eventually use electricity to compete with its neighbors is admitted and it is not thought that the matter will be ignored.

While the Delaware, Lackawanna & Western Railroad will not do a great deal in the way of shop construction during the year just beginning it is more than probable that the end of the coming 12 months will see the commencement of the company's plans to tunnel the Hudson River and electrify its lines running into Hoboken. The company will, however, build a large locomotive shop in connection with its plant now in the course of construction at Kingsland, N. J., and the new terminal at Hoboken will, of course, be nearly completed by next December. Work on that structure is now under way. A new paint shop will be erected at Buffalo and other plans for improving the company's repair plants call only for minor machinery additions and general improvements of an unimportant nature. The company will make some extensions to its lines, the principal item of which will be the construction of 7 miles of track from Scranton to Moscow, Pa., and the freight car construction plant at Scranton, which covers $6\frac{1}{4}$ acres and which is now completed, will be put in full operation. The culmination of the company's scheme to do away with its grade crossings on its branches adjacent to Hoboken will not permit the engineers time to take up the question of electrifying its lines to any great extent, as that matter can hardly be seriously considered until the grade crossings are done away with. Lincoln Bush, chief engineer of the road, is confident, however, that next December will witness the conclusion of this work, and then there is no doubt that action toward electrifying the more important branches of the lines close to the Hoboken terminal will be taken. The new locomotive shops at Kingsland will be 106 x 606 feet; some 480 tons of steel will be used in the construction. This work will be well under way by spring. The company has a small locomotive shop at that point and some of the machinery there will be moved to the new structure when it is completed, but the equipment will be by no means sufficient to supply the plant according to the plans laid out for it. That part of the plant which has been begun will be put in operation by April 1; machinery to complete its equipment is now being purchased. This consists principally of wood working machinery for the mill and some machine shop equipment. Work on the terminal at Hoboken has been begun and the terminal, which will cost about \$3,000,000, will be so far toward completion by the end of the year that the temporary terminal now at that point will have been done away with and the train shed and sufficient of the new structure to take care of the ordinary traffic of the road will be in operation. The terminal will be 600 feet long on the river side and an electrically illuminated tower will surmount the station. About 4500 tons of structural steel will be used in the work.

About the last of the year the Philadelphia & Reading Railroad closed for the greater part of its \$200,000 list of machine tools, but there still remains a number of tools which were specified to be purchased. While these tools have only just been arranged for, it is generally thought that the road will come into the market for quite a little more machinery the early part of the year, as it has under way extensive improvements.

The Baltimore & Ohio Railroad is planning extensive improvements along its line, particularly at its Philadelphia terminal.

Probably the most important work in the way of shop construction to be done in the near future by the Cleveland, Cincinnati & St. Louis Railroad is the new shops to be erected at Indianapolis, Ind. The company is sadly in need of repair shops at that point and while plans for the buildings have not yet been completed it is understood that improvements there are to be made at a cost of about \$2,000,000.

Plans have been completed for the improvements to be made by the Duluth & Iron Range Railroad at Two Harbors, Minn., at a cost of about \$500,000. A new tank shop, 80 x 144 feet, will be erected, which will be equipped with two 20-ton traveling cranes and other modern machinery for the work required. An addition to the machine shop will be 95 x 103 feet and will be equipped with a 200-ton overhead traveling crane, which will easily transfer the largest locomotive from one part of the shop to the other. The boiler and blacksmith shops will be extended 58 feet and a new power house of 900 horse-power capacity will be erected. The power plant will supply electricity for operating the machinery in the shops and the new coal docks as well as lighting the various buildings and ore docks. Some of the machinery has been secured; the remainder will probably not be purchased until the new buildings are completed.

The railroads to build shops this spring will probably include the Western Maryland Railroad, which has for the last few months had in contemplation the erection of new buildings of considerable proportions. While the matter has not yet been definitely settled, it is thought that the buildings will be erected in the neighborhood of Hagerstown, Md.

The Great Northern Railroad contemplates the erection of extensive shops at Minneapolis, Minn.

It was announced a short time ago that the Union Pacific Railroad would shortly begin the construction of new locomotive shops to cost in the neighborhood of \$350,000. The site for these, according to latest advices, has not been selected. It is probable that this work will go on this year. At Omaha, Neb., the company will add to its shop facilities and it may be that the new shops will be erected in connection with those at that point.

The Chicago, Milwaukee & St. Paul Railroad, which is adding a passenger car repair shop, 90 x 575 feet, to its plant at Milwaukee, Wis., will in the spring extend the two car department buildings 200 feet, and a new two-story pattern shop, 60 x 150 feet, will be added.

New Manufacturing Plants.

A great deal of business was obtained last year from the various steel companies which made large improvements and the purchases of some of the companies are likely to extend into the new year, particularly those of the John A. Roebling's Sons Company, which has not yet completed its large plant at Kinkora, N. J., and Milliken Bros., who are constructing new works on Staten Island. The United States Steel Corporation is also looked upon as a large purchaser of machinery during 1906.

The Bethlehem Steel Corporation, South Bethlehem, Pa., intends to make important improvements at its South Bethlehem works and also has in contemplation large extensions to its Union Iron Works at San Francisco, Cal.

The Southern Steel Company, which recently took over the properties of the Alabama Steel & Wire Company and the Underwood Coal & Iron Company, has prepared plans for largely developing its property. It is the intention to increase its open hearth capacity by 50 per cent. and to materially enlarge its wire plant at Anniston, Ala.

The Follansbee Bros. Company, Pittsburgh, Pa., is to erect an open hearth steel plant adjacent to its works at Follansbee, W. Va. The present hot mill building will be extended to a length of about 900 feet, or about double its present size.

Important in the way of machinery requirements will be those of the Tennessee Coal, Iron & Railroad Company, which is planning to erect a large cast iron pipe foundry.

The Pennsylvania Steel Company has in contemplation the building of large additions to its plant at Steelton, Pa.

The Standard Steel Car Company, Pittsburgh, Pa., has organized a new company, to be known as the Standard Steel Car Wheel Company. It proposes to erect a plant at Butler, Pa., for the manufacture of steel car wheels.

Large additions were made to the plant of the Schoen Steel Wheel Company, McKees Rocks, Pittsburgh, and during the past year \$500,000 was expended by the company in making improvements. It expects to expend \$1,000,000 in betterments next year.

A tract of 35 acres of land at Buffalo, N. Y., was pur-

chased by the Otis Elevator Company, New York, which will shortly begin the erection of a large plant, plans for which are now being prepared. While the sizes of the new buildings have not been determined, it is understood that the plant will be as large as if not larger than any one of its existing plants.

The American Locomotive Company, New York, will build a steel casting plant during the year to make its own heavy castings. No plans have been prepared as yet, but they will probably come to a head before many weeks. The company has additions under way at the Brooks Works, Dunkirk, N. Y., consisting of a foundry and erecting shop. The company is preparing to build steam shovels at that plant also and a new foundry is under way at Schenectady. While no other plans have been prepared for large extensions during the year, financial provisions have been made for extensive purchases of machinery to be distributed at the various plants of the company. It is thought that the year will see an extension of the automobile and electric locomotive branches, while the various plants which are now running at full capacity will receive important additions in the way of machinery.

Another plant which has been on the tapis for a long time is the one which the Lidgerwood Mfg. Company, New York, intends to erect in the Waverley section of Newark, N. J. While the company has plans to build a foundry, large machine shop and power house, only the foundry, power house and pattern storage house will be erected immediately. The rest of the plant, it is understood, will be built later on. The foundry will be 120 x 600 feet and the power house 40 x 245 feet, of 1000 horse-power capacity. The size of the machine shop has not yet been settled.

The United States Cast Iron Pipe & Foundry Company, New York, which is making improvements to its plant at Burlington, N. J., to cost in the neighborhood of \$100,000, is to build a foundry 130 x 150 feet, a machine shop and power house. Plans for the proposed machine shop and power house have not been completed as yet and the details of equipment will be arranged later on.

The Gleason Works, Rochester, N. Y., which has started upon the erection of its new plant, will probably construct several additional buildings this coming year. The company owns 20 acres of land adjacent to the New York Central & Hudson River Railroad and intends to eventually move its entire plant to the new location.

In view of the fact that the Standard Roller Bearing Company, Philadelphia, Pa., will come into the market within the first 30 to 60 days of the new year, the plans of the company are important at this time. During the past month it purchased about \$60,000 worth of machine tools and there are many more for which the company is not ready to specify that will be required for equipping its new shops. In addition the company will be in the market within the next 30 to 60 days for a complete iron and brass foundry equipment, consisting of cupolas for gray iron casting, oil burning furnaces for brass castings, molding machines, flasks and other foundry apparatus. Work of construction on its new iron and brass foundry, 60 x 125 feet, two stories, has been started, and the crucible steel casting plant, 60 x 95 feet, is completed and in operation.

Another company that is now in the market for a large amount of machinery is the recently organized Hobbs Mfg. & Stamping Company, New Orleans, La., which is to erect a large plant for the manufacture of pressed and stamped tinware, enameled ware, &c. The plant of this company will occupy 5 acres of ground and will be equipped with metal stamping machinery and presses, die and machine tools and other modern machinery.

Owing to difficulties with the municipal authorities the Otto Gas Engine Works, Philadelphia, Pa., did not build its new plant at Wilmington, Del., last year, as it had expected to do. Late next spring the company expects to take the matter up and go ahead with the construction of the plant on the 57-acre site which it owns.

The Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa., contemplates making some extensive additions to its plant, the plans for which have not yet been made, but will shortly be taken up by the Board of Directors.

As a consequence of the large demand for pneumatic tools and compressors the Chicago Pneumatic Tool Company, New York, has very materially increased its capacity, and will soon double the capacity of its works at Franklin, Pa., by the erection of new buildings and the installation of additional equipment.

The Oil Refineries of Mexico Company, New York, of which Percy M. Furber is president, is developing extensive oil properties in the State of Vera Cruz, Mexico, and will probably come into the market during the winter for a large amount of machinery.

The American Can Company, New York, will undoubtedly be a liberal purchaser in the machinery market during the coming year, judging from its plans for factories under way and contemplated. A site has been purchased in Chicago for a factory to cover a ground area of about 100 x 400 feet and which will be five stories high. This plant may not be built within a year, but the company is now putting up a new packer's can factory at Maywood, Ill., of a ca-

capacity of from 750,000 to 1,000,000 cans a day. This will be by far the largest can factory in the country. The company is also erecting a factory at Lubec, Maine, to be devoted entirely to the manufacture of sardine boxes. Plans are being prepared for a plant to be built during the year at New Orleans, and it will be used for both the manufacture of packers' cans and a general assortment. Another general and packers' can factory is to be built at Savannah, Ga. The equipment for the majority of this work will be purchased during the year from points adjacent to the various structures.

Peacock's Iron Works, Selma, Ala., has decided to build a new plant, the plans for which have not yet been completed.

The American Wood Working Machinery Company, New York, has bought 10 acres of land at Gates, Long Island, N. Y., where it intends to erect a new plant, the plans for which will not be made for some time.

The recently organized Wheeling Enameled Iron Company, Wheeling, W. Va., is installing a new plant.

An extensive tract of land on Staten Island has been purchased by the Proctor & Gamble Company, Cincinnati, Ohio, where it intends to erect a large plant for the manufacture of soap.

From the fact that the machinery equipment will be purchased in this country it is of interest to note that the Owens European Bottle Machine Company, controlled by the Owens Bottle Machine Company, Toledo, Ohio, intends to install a new plant in England, following the completion of which other new plants will be erected in different countries in Europe.

The General Electric Company has not mapped out plans for any large building this coming year, the only construction work it has in view at this time being at the Lynn, Mass., plant, where new structures will be erected.

Steel Passenger Cars and Merger of Builders.

It is probable that before long announcement will be made of the merger of the more important street railway car builders. The merger is being organized by Kean, Van Cortlandt & Co., 30 Pine street, New York, and it is expected that the end of the present month will see its completion. A number of large street railway car manufacturers have absorbed smaller firms and several moves in that direction indicate that the combination is practically completed. It is very probable that a number of the interested companies will take up the question of manufacturing steel cars for street railway use, as this has been talked of among manufacturers for some time.

The development of steel cars for street railway purposes as well as other railroad uses was extensive during the past year, and those interested in that form of manufacture predict that the present year will see a large increase in the manufacture of steel cars.

An unusual number of cars of all sorts were built during the past year. Figures recently compiled show that 168,000 cars were built during 1905. These included cars for use on subway and elevated railroads, but the figures are exclusive of street and interurban electric cars. A large proportion were of steel construction and those who now build steel cars have work for months ahead.

The Pressed Steel Car Company built a large new plant at McKees Rocks, Pa., during the year for the building of steel street railway cars, and the American Car & Foundry Company largely increased its steel car capacity. The Pullman Palace Car Company has been spoken of as a future manufacturer of steel passenger cars. Indications are that wooden passenger cars will ultimately be replaced by steel cars.

The Ralston Steel Car Company, Rarigville, Ohio, which was organized with a capital stock of \$1,000,000, has been transforming its shops, formerly used for manufacturing engines and disappearing gun carriages, into a plant for making steel freight cars and passenger cars.

Tunnel and Power Work.

Present indications show that tunnel projects in and about New York are developing enormously. It is probable that during the early part of the year an important portion of the proposed additions to the New York Subway will be advertised. The entire scheme is of too great magnitude to be undertaken as a single job and therefore its division will become necessary. If this is done it is likely that one or two of the most needed routes to Brooklyn will be commenced and a north or south line on the east or west side (or perhaps both sides) of Manhattan. These would provide relief for the overcrowded district south of Canal street in the least possible time. The plans of the Rapid Transit Commission call for 19 separate routes, covering the boroughs of Manhattan, the Bronx and Brooklyn. The East and Harlem rivers are to be crossed by 24 lines of tracks. Owing to the nature of the material forming the beds of the rivers and because of other considerations it is probable that each track will be carried in a single iron lined tube similar in design to those built under the Hudson and to those now being built by the Pennsylvania Railroad under both the East and Hudson rivers. The beds for the

most part are rock, exceedingly irregular and by no means homogeneous. This will require the shield method of tunneling and the accompanying air compressing and electric lighting plants. There will also be needed a large equipment of cars and track, mining machinery for rock work and iron plates for lining the entire length of each tube. It is impossible to estimate even approximately the amount of supplies, material and tools that will be required by the work, because the intention of the Rapid Transit Commission has not been made public. The routes laid down by the commission are estimated to cost in the neighborhood of \$200,000,000. If two north and south lines and two lines to Brooklyn are let this year the cost will be over \$60,000,000. The ordinary and usual course would be followed in the construction, the same as was pursued in the case of the Subway. One general contractor took the contract for the whole work and then divided it into sections and sublet these. A great amount of machinery would be required for the land portions of the routes, since the work would be carried forward from many separate points. The merging of the Interborough Rapid Transit Company and the Metropolitan Railway Company, and the placing of the whole surface railroad, elevated railroad and subway transportation systems under one control may have an important bearing upon the time of construction of these new lines.

Another contract of great importance and unusual size, the plans for which have been completed, is the double line of tunnels extending from the Pennsylvania Depot in Jersey City across the Hudson to Cortlandt and Fulton streets, New York. In New York the route forms a loop extending east along Fulton to Church, to Cortlandt and back to the river. On the Jersey side will be a T running north and south parallel with the shore. This will connect with the Central Railroad of New Jersey on the south and with the Erie and Delaware, Lackawanna & Western on the north. At this point the river is a little over 1 mile wide. The Jersey City portion of the T will be about 2 miles long, so that the total length of single track tunnel will be about 7 miles. This does not include the part in New York, which will in all probability follow the type of construction adopted for the Subway. This was steel supporting columns and side walls of concrete or masonry and the usual form of roof construction of steel beams with concrete arches sprung between. The entire river portion of the line will be built by the shield method of tunneling with compressed air. Although the plans have not been made public, it is probable that the same method will have to be followed on the Jersey side, as the entire route is through filled in ground, more difficult to tunnel through than the undisturbed silt forming the bed of the river. The tubes will be lined throughout with flanged iron plates. The entire line will require more than 160,000 tons of plates. These plates are planed on the four flanges in order to insure perfect joints. In addition to the machinery necessary for this work there will be needed the usual amount of small tools. Complete electric lighting outfits will have to be installed and compressed air plants in duplicate, with the necessary engines and boilers for their operation. The work of tearing down the old buildings has begun at Fulton and Church streets, where the New York station will be located. From this station connection will be made by a foot passage with the Fulton-John street station of the present Subway. On the site a 20-story office building will be erected. These tunnels as well as the old Hudson River tunnel are controlled by the Hudson Company.

Work on the old Steinway tunnel, under the East River at Forty-second street, through which the August Belmont traction interests will establish direct connections between the New York subways and the trolleys and other surface lines of Queens County, is well under way and most of the contracts for machinery equipments have been placed. Nearly one-half a block of property in Long Island City has been purchased for a terminal there and a shaft is being sunk at that end, while two others are in operation on the New York side. A large station will be erected on the Long Island side for the tunnel car lines, and the tunnel, which will be below that of the present Subway, is well under way. There will be two tubes, in most respects similar to those of the Pennsylvania Railroad Company under the North and East rivers. The engineers in charge expect to tunnel through a considerable area of rock and on that account the amount of castings used will be somewhat less than those used on other recently constructed tunnels.

The north tube of the original Hudson River tunnel is being finished and the south one is approaching the New York side.

The Pennsylvania tunnels are well under way, the one under the North River being nearly completed.

The Michigan Central Railroad has obtained permission to build a tunnel under the Detroit River, connecting Detroit, Mich., and Windsor, Canada. Although the building of the tube will not be so great an undertaking as any of the New York projects, it will require a considerable amount of mechanical equipment. Plans are now under way and it is probable that before long work will actually be commenced.

The plan of the Public Service Corporation of New Jersey to enter New York will come to a head during the year, and, as a matter of fact, work of constructing its proposed high speed electric railway between Newark, N. J., and New York has been begun. This will undoubtedly entail an addition to the huge power plant on the Hackensack Meadows, while transmission stations will probably be built along the line. The large repair plant and car building shops to be built in connection with the Plank Road plant of this company at Newark, N. J., will shortly be completed and other plans for plant extension will probably come up.

The New Jersey Terminal, Dock & Improvement Company, which was incorporated some time ago at Trenton and which is connected the Hudson Street Railway Company and the Hudson Companies, has plans to operate trolley lines in Hudson County, N. J., and to build a large power house and car sheds on the Hackensack Meadows. The company will operate extensively throughout Hudson County and will connect with the tunnels of the Hudson Companies. The plans for the power house will be taken up on the completion of the Hudson tunnels, if not before.

The Westchester County system of the New York, Westchester & Boston Railroad will be constructed during the year, and the plans include a large power house, machine shop, converter stations, repair shop and other structures. The power station will be about 1500 kw. and there will be three converter stations. The company has in course of construction a four-track third-rail electric railroad in Westchester County to connect with the subway system in New York. No plans for the buildings have been prepared as yet, but it is expected that they will be completed before many weeks.

Plans and estimates for, including the Esopus water shed, extending the sources of New York's water supply are under way and the city will probably spend about \$106,212,000 to develop a water supply of 250,000,000 gallons daily. For a filtration plant an additional estimate of \$645,000 is made.

The State Canal Board is preparing to let a number of new contracts on the 1000-ton barge canal. It is expected that at least \$5,000,000 will be used during the coming year. The Canal Commission has arranged to issue bonds at the rate of \$10,000,000 every two years to cover this work, and in order to consume this year's appropriation a number of important contracts will be let.

Work on the hydraulic power plant to be erected by the Chattanooga & Tennessee Power Company on the Tennessee River, and which will furnish power for the city of Chattanooga, is well under way and will be completed within the year. The plant will be from 30,000 to 40,000 horse-power, and a lock and dam is being built in connection with it.

New Works for Canada.

The rapidity with which Canada is being developed is manifested by the number of American houses which have established plants in that country. Within the past year several pretentious plants have been started or placed in operation which are practically branches of the main works here, until now there is quite a colony of American manufacturing institutions. The extension of the railroads has been a factor in inducing companies to locate works to build steel cars and locomotives. The general expansion of trade within the Dominion and in foreign countries has caused a large demand for mechanical equipment, and in order to cope more successfully with the fast growing Canadian consumption of machine tools, as well as to compete more successfully for the trade of such foreign countries as maintain discriminating duties against the products of the United States, many of the important machinery houses have established or are planning Canadian branches. From the projects under way it would appear that the Canadian demand for American machinery will increase this coming year and that the number of works producing mechanical equipment will be considerably augmented.

The granting of bounties has been given considerable attention by the Canadian Government and by this means some large plants have been established. At the present time the question of granting bounties for steel shipbuilding is on the tapis, and should it be decided favorably the coming year will no doubt see work started on one or two large shipbuilding yards. The two projected plants are the Shipbuilding & Investment Company, of which G. S. Campbell is president and which purposes to build at Halifax, Nova Scotia, and the Cape Breton Coal, Iron & Railway Company, with which are associated Horace Mahew and W. L. Gladstone and which purposes to build at Sydney, Nova Scotia.

One of the most important projects now under way is the construction of the Grand Trunk Pacific Railway, which is vigorously pushing work and hopes to have at least 1000 miles of roadbed in the hands of contractors early in the spring. This road is to establish large shops and a union depot at Edmonton. Frank W. Morse, with offices at Montreal, is vice-president and general manager.

The Intercolonial Railway of Canada has set aside a

large sum of money for improvements to its system, a good part of which amount is to be expended at Moncton, N. B., where new shops are contemplated.

The Prince Edward Island Railway, Charlottetown, P. E. I., has not yet perfected plans for rebuilding its shops, which were recently destroyed by fire. The company is now using its other buildings for temporary quarters to work in during the winter.

A new company has been formed in Canada by interests closely allied with the Simplex Railway Appliance Company, Canada, and 42 Broadway, New York, for the manufacture of steel cars in the Dominion and to compete with the Canada Car Company and its affiliated interests for the Canadian car trade. The Canadian Car Company recently built a large new plant in Canada and the new organization, if it carries out its intention in becoming an aggressive competitor, will necessarily erect an extensive plant. For the purpose of organization a temporary company, known as the Dominion Steel Car Company, has been formed with a capital of \$500,000, with the avowed intention of erecting a plant in Montreal, West. The promoters of the company include Chicago, New York and Canadian capitalists. No plans for the proposed new plant have been prepared as yet and only in a general way has the construction scheme been outlined. The company will erect an extensive, up to date plant for the manufacture of steel cars, and later on, according to a statement made by an officer of the company, will fit out a plant for building wooden cars. The steel car plant will be built first, however, as a feature will be made of that class of work. The work of building the plant will be done as soon as a permanent organization has been effected, and it is the intention of those interested to have it finished within the year if possible.

The Canadian Locomotive Company, Kingston, Ontario, proposes an addition to its plant which will practically double the capacity.

The Canadian Rand Drill Company, which is the Canadian branch of the Ingersoll-Rand Company, New York, will build extensions to its works at Sherbrooke, Quebec, during the year, plans for which have not as yet been prepared. The improvement will include a new foundry.

If the present plans of Rhodes, Curry & Co., Amherst, Nova Scotia, are carried out it is likely that they will purchase a lot of new machinery. They recently equipped a building as a planing mill and are looking forward to converting this into a steel freight car building plant.

A site for a new plant at Fort William, Canada, has been purchased by the J. I. Case Mfg. Company, Racine, Wis., but no plans have been made for immediate construction. The matter is expected to be taken up in the course of the next eight or ten months.

At Hamilton, Ontario, where a site has been secured, the American Horse Shoe Company, Phillipsburg, N. J., contemplates the installation of a new plant.

The Vermont Farm Machine Company, Bellows Falls, Vt., has taken out a license to manufacture separators in Ontario, Canada, and it is possible a plant may be erected.

Government Purchases.

Owing to the war the demand for American machinery from the Orient was largely increased in the past year, Japan having placed orders for an enormous amount of machinery at one time, and from European countries a material increase was noted. Merchants have not been slow to follow up the advantages of the introduction of their tools, particularly in Japan, and many of them have established agencies or strengthened their position in order to capture a share of the business, while others are preparing to be properly represented in that country. From Russia substantial orders were received, but owing to the unsettled state of the country deliveries have been withheld. When order is restored it is expected that the stop orders will be relieved and the shipments made. From the foreign field merchants are looking for a very substantial business this year, particularly from Russia and Japan, which will have a great deal of development work to do. The change in the former country's tariff favorable to our products will no doubt exert a good influence. In Japan development work is going on with great vigor, attention being especially given to mining operations, which it is anticipated will be a good source of revenue. Steps are also being taken to enter the Chinese market. Other countries which maintain a prohibition tariff against the products of the United States will likely become good customers of machinery houses having plants in Canada.

Machinery houses have been much favored by the different departments of the navy and the Isthmian Canal Commission, both of which have bought largely the past year. Work of digging the Panama Canal has only just begun and prospects are for steady purchases of machinery equipment for some time to come.

In connection with future naval purchases the recommendation for the Washington gun factory for the following improvements will be of interest: New machinery for existing shops, \$150,000; new brass, iron and steel foundry, \$300,170; machinery, &c., for proposed foundry, \$121,075;

new pattern shop building, \$300,160; building for new sighting shop, \$87,000; machinery for proposed sight shop, \$150,000; building for shop for medium and small guns, \$190,800; machinery for proposed gun shop, \$368,930; new forge shop building, \$134,937; machinery for proposed forge shop, \$148,000; extension of gas plant, \$99,611; locomotive house, \$61,747; machinery for locomotive house, \$12,000; extension of east and west gun carriage shops, \$334,448; machinery for proposed extension, \$660,232; 75-ton locomotive crane, \$16,000; fourth battery of boilers (5300 horse-power), completing the plant, \$50,000.

For the navy yards Admiral Rae has submitted a statement covering in part the requirements of the leading navy yards and naval stations, as follows: Portsmouth Navy Yard.—A machine shop is nearing completion. The bureau asks for \$100,000 for new tools for this yard. It also asks for the completion of the boiler shop and pattern shop authorized, and for the construction of a foundry, forge, coppersmith and pipe fitting shop and a storehouse. Boston Navy Yard.—A copper shop and the extension of the foundry wing are asked for and \$50,000 for new tools. New York Navy Yard.—A new copper shop is needed; also a building for the storage of completed machinery, material for immediate use and patterns. The extension of the brass foundry is asked for. Charleston Navy Yard.—A boiler shop, pattern shop and administration building are asked for. It is proposed to move the machine shop from Port Royal to this yard and an estimate of \$100,000 is made for necessary tools. Naval Station, Key West.—The most urgent need is a foundry. The present building is 38 x 70 feet and was built in 1875. It has not sufficient capacity for an emergency and a new building will be required in the near future. Pensacola Navy Yard.—The steam engineering plant must be materially enlarged. A new machine shop, with modern tools and appliances, is now a necessity. Many new tools have become an absolute necessity. An estimate of \$50,000 is made for new tools. Mare Island Navy Yard.—A new foundry, smithery, boiler shop, coppersmith shop, pattern shop and administration building are recommended. For the naval station at Cavite \$50,000 is asked for new tools. A steam engineering building is recommended at Guantanamo, Cuba, and \$40,000 for tools.

Chicago Machinery Market.

CHICAGO, ILL., January 2, 1906.

Railroad activity is largely responsible for the unparalleled record made by the Western machinery trade in 1905. Heavy purchases of tools and shop equipment for additions to existing plants and new undertakings were made during the first half of the year and supplementary purchases of large volume were made during the closing months of the year, when the demand for tools and equipment for industrial operations was at its height. Manufacturers throughout the West and Northwest who pursued an extremely conservative course as regards additions to equipment in the past few years found their capacity insufficient to the heavy demand for all commodities which began early in September and almost a general movement immediately set in for equipment additions. Stocks in the hands of manufacturers and dealers were soon depleted, and early in October it was impossible to secure deliveries on almost any kind of a tool in less than two to three months. The inability of users to secure early deliveries of new tools was followed by an equally heavy demand for second-hand equipment and prices on all desirable machines were immediately enhanced, and in many instances old tools were sold at prices averaging only 10 to 15 per cent. below the selling price of the new equipment. Dealers were also able to dispose of many tools that have been on their floors for several years, type, style and efficiency being sacrificed to secure prompt delivery. Prices of new tools, which remained practically unchanged for more than two years, were gradually advanced during the closing months, the heavy demand and increased cost of raw material being the only factors that led to these higher quotations. The demand for power plant equipment could not be met by the builders and prices of used boilers, engines, pumps, generators, air compressors, &c., were enhanced to a level almost equal to the value of new installations. The placing of large units in the numerous new office and store buildings called for heavy equipment, and material increases to the power generating plants of many industrial works were also made. The active promotion of interurban railroads in the Middle West has drawn heavily upon the manufacturers of electric power equipment. The demand for equipment for municipal improvements, such as water works and electric light plants, also showed a heavy increase over that of 1904. Among the noteworthy equipment purchases were the following:

Railroads.—Illinois Central, \$120,000 equipment for various shops along its lines; Chicago, Burlington & Quincy, \$100,000 list of heavy machine tools for existing plants; Chicago & Alton, Santa Fé, Chicago & Northwestern and Chicago Southern, equipment for new shops and additions aggregating \$500,000; Union Pacific, miscellaneous tools; Northern Pacific, lathes, drills and planers; Chicago, Lake

Shore & Eastern, hydraulic tools; Rock Island, varied assortment for distribution among its shops; Pennsylvania lines west of Pittsburgh, about 60 machines; Chicago, Hamilton & Dayton, new shops at Ivorydale, Ohio; Frisco System, \$125,000 equipment, shops at Memphis; Missouri Pacific, \$1,500,000 equipment, new shops at Sedalia, Mo.

Industrial Enterprises.—Illinois Steel Company, \$2,000,000 addition to equipment at South Chicago; American Steel & Wire Company, miscellaneous tools for Anderson, Ind., and other plants; American Radiator Company, equipment for all its plants; Western Electric Company; Morden & Crossing Works, new plant at Chicago Heights; Chalmers & Williams, new plant at Chicago Heights, \$65,000 machinery equipment; Winslow Brothers Company, new ornamental iron plant; International Harvester Company, heavy purchases for all its plants, particularly Milwaukee, where the gas engine output was greatly increased; Kellogg Harvester Company, Plano, Ill.; Allis-Chalmers Company, \$3,000,000 improvements at Milwaukee; Bucyrus Company, Milwaukee, equipment addition; Davenport Locomotive Works, Davenport, Iowa, addition to machine shop equipment; Brunswick-Balke-Collender Company, Chicago, large plant at Muskegon, Mich., and Long Island City, N. Y., which called for a large amount of wood working and other equipment; Morgan & Wright, \$500,000 new plant at Detroit.

Power Plants.—Marshall Field's addition, Mandel Bros.' addition, Boston Store, Hillman's addition, The Fair addition, Sears, Roebuck & Co. new plant, North Shore Electric Company; Kalamazoo, Benton Harbor & South Haven, 3000 to 4000 kw. in generators; South Side Elevated road, entirely new power plant at Fortieth and State streets, calling for about 6000 horse-power in boilers and other equipment in proportion; Chicago & Southern Traction.

New England Machinery Market.

WORCESTER, MASS., January 2, 1906.

The New Year starts in with exceeding contentment in manufacturing circles all through New England, the machinery lines being as prosperous as any. The only fly in the ointment is the lack of facilities for taking care of the great demand for machine tools. Customers appear to be unable to grasp the reason why deliveries are not always as promised, and no amount of explanation seems to make matters clearer. The dealers say it is as much work to get machinery from the manufacturers as it is to get the orders. One of the veteran dealers of Boston, probably the dean of the New England trade, asserts that the present condition has no precedent since 1883. In that year a great boom struck the trade without warning, and everyone, dealer and tool builder alike, was caught entirely unprepared. In the present instance there has been sufficient warning, for pretty much everyone saw prosperity coming, yet with this preparedness and the vastly better facilities for manufacturing compared to 1883 the production of the machine tool shops is not adequate to supply the demand. One estimate has it that about three tools are being built to every four ordered.

The results of inventories, completing the record of the business of 1905, proves that the year was a prosperous one in most lines of business, much better as a rule than 1904, as was expected. In the machine tool business the bulk of the year's business was crowded into the last few months, making a very satisfactory total. The dealers also had a much better year than that before it. December went out with a rush of orders given at the last moment in order that they would surely be billed in the New Year.

Nothing could be more auspicious than the opening of 1906. Confidence prevails everywhere that the good times have only begun, and business plans are being laid on that basis. The machine tool building capacity will be largely increased in the spring, plans for enlargements being numerous, and present capacities are being increased by the rearrangement of machinery and the installation of new tools in existing space.

The readjustment of prices on lathes is not yet completed. A general flat increase in prices has been made, in accordance with the vote of the National Machine Tool Builders' Association at its special meeting, but the advance will not stop there. The increase was a minimum one. It will be greater on some tools than the rate named in the vote of the lathe section of the association. The manufacturers are now waiting for the tabulated prices of all the lathe builders in the association, wishing particularly to get at the weights. As an example of the reason for this the 14-inch lathe of one manufacturer may be heavier than the 16-inch machine of another, in which case the advance would be naturally affected. When this complete knowledge has been obtained advances will be made beyond that flat increase. It is interesting to note that the demand for machine tools has shown marked increase since higher prices went into effect.

The foundries of New England are very busy indeed. Many of them have had to decline orders from other than

regular customers. Inquiries are received from far beyond the borders of the New England States.

The Pratt & Whitney Company, Hartford, Conn., is getting out plans for a large new machine shop building which will be erected early in the year. The building will be L-shaped, one wing to be about 70 x 183 feet, the other about 60 x 188 feet, inside dimensions. The building is planned for four stories, which, with a one-story extension, will aggregate a floor area of something over 100,000 square feet. The company has already begun the erection of a new foundry, mention of which has been made in *The Iron Age*. The steel work of the building is now partly in place.

The Potter & Johnston Machine Company, Pawtucket, R. I., manufacturer of machine tools, is adding an erecting shop to its works, the new building being 70 x 149 feet and one story.

George F. Westcott, the George F. Westcott Company, Buffalo, N. Y., has been in New England the past week looking for automatic metal working machinery.

The Connecticut Computing Machine Company, New Haven, Conn., has made an arrangement with the W. S. Burn Mfg. Company of that city by which it will occupy a part of the Burn Company's building, formerly the plant of the Housatonic Mfg. Company. The Connecticut Computing Machine Company, which has been mentioned in these columns as its plans have progressed, will manufacture a computing machine, the invention of Fred. M. Carroll, New Haven. The machine is very highly spoken of and its backing is of the strongest, the *personnel* of the stockholders and officers being a very unusual one. Organization has been effected by the election of these officers: President, Lieutenant-Governor Rollin S. Woodruff, New Haven, of C. S. Mersick & Co.; vice-president, Charles M. Jarvis, New Britain, American Hardware Corporation; treasurer, William H. Tyler, New Haven; secretary, Edward S. Swift, New Haven; assistant secretary, Fred. M. Carroll, New Haven; directors, Lieutenant-Governor Woodruff, Mr. Tyler, Mr. Swift and Max Adler, New Haven; Mr. Jarvis and Charles Glover, New Britain; William H. Lyon, Meriden; William E. Fulton, Waterbury, and Edward H. Sears, Collinsville. The company has an authorized capital stock of \$600,000, of which about three-quarters is now being disposed of. The work of manufacturing will begin immediately.

The Robb-Mumford Boiler Company announces that it has moved from Cambridge, Mass., to South Framingham, Mass., where its new plant is ready for occupancy. This company is an offshoot of the Canadian plant of similar name. Soon after its organization it purchased the boiler business and equipment of Edward Kendall & Sons, Cambridge, an old established firm.

Rand, McNally & Co., printers and publishers, Chicago, New York and Boston, have secured a tract of land at Ossining, N. Y., and will build a large plant on the premises. The site is on the New York Central & Hudson River Railroad, lying between the tracks and the Hudson River, affording shipping facilities both by rail and water. A large power plant will be installed. The reason for the new plant is the fact that the large works at Chicago are no longer adequate.

The Boston-Cambridge subway is apparently getting very near to an assured fact. The city government of Cambridge has passed an order agreeable to the Boston Elevated Company authorizing the Mayor to enter into negotiations with the company under the terms of an act of Legislature which provides as an alternative to an elevated structure the building of a two-track subway from Craigie Bridge, Cambridge, through Bridge and Cambridge streets to Harvard square, and from Cambridge street at Webster avenue to the Somerville line. The acceptance of this provision will revoke the rights of the elevated to build elevated lines in Cambridge excepting such as may be necessary to make connections, including approach to an elevated line at Somerville.

The Maine shipyards have had an exceedingly poor year. A carefully prepared annual review indicates that only 13,771 tons were launched during 1905, as compared to nearly 42,000 in 1904. The single district of Bath usually builds a greater tonnage than the entire State produced the past year. The principal reason for this, it is said, is that barges are replacing sailing vessels, not only in the coal but in the lumber trade. The square rigged vessel has long since disappeared as a Maine product. The depression appears to be a result of the progress of steam as against sail for the coasting trade, but coupled with it all is the fact that materials have been very high during the past year and ship owners have been shy of placing contracts for new tonnage.

The Union Steamship Company, which will be operated in connection with the Union Oil Company, has been incorporated in San Francisco, Cal. The capital stock is \$5,000,000. It is stated that the company will enter the transportation business between Pacific ports and Panama and the Orient, and also operate steamships between the eastern side of Panama and Europe.

HARDWARE

IN this issue there is an unusual amount of retrospective matter as we refer with some fullness to the history of the past half century and to some of the trade features of the year which has closed. The recalling of the course and conditions of business in 1905 is a genial and grateful task, for the year stands out conspicuously as notable for its prosperity, being characterized by a great volume of trade with strong and advancing prices, and confident anticipations of good business based upon enormous crops, uninterrupted industrial activity, broadening markets and general well being. The half century is likewise notable as perhaps the 50 years of history in which there has been the most progress in manufacturing and commerce and the most pronounced development of material civilization. There has been in it an extraordinary activity in invention, in manufacturing, in the widening of markets, in the increase of wealth and in the complexity of business relations. In the midst of the changes which have taken place in every line of business the Hardware trade also has progressed, so that it is to-day strangely different from what it was half a century ago. An incident in this general development is the fact of the establishment of *The Iron Age* and its publication as a trade journal during all the years. While this has undoubtedly contributed not a little to the progress which has been made in the lines with which it has specially to do, the journal itself is unquestionably an illustration of the half century's productiveness in the development of new methods and agencies which have had large part in the extraordinary industrial and commercial progress which has characterized the period.

Fortunately the progress represented by the past year and the past half century has not been checked. The trade enters upon the new year and this journal upon its second half century with the movement we are called upon to review unabated. There is no relaxing in the pace. Manufacturing is still increasing in volume and in the variety and usefulness of its product. Business has to do with greater transactions and is more complex in its relations than ever. The field is constantly enlarging as the country is opening up and being occupied, while at the same time there is a growing demand from every class in every community and an increasing trade with far-off markets, the most distant of which with existing facilities of communication and transportation are at our very doors. One of these days there may come something to interfere with our commercial and financial well-being, but a continuing and apparently growing prosperity is still the dominant characteristic of the opening of 1906. The opportunities for enterprise and for successful work on larger or smaller scale, so far from being exhausted, are apparently more numerous and inviting than ever for those who have the ability to improve them. In a multitude of interests the elementary stage only has been reached and the coming years will witness a progress that will be a fitting continuation of the marvelous movement we are permitted to recall and chronicle to-day. In the midst of this stirring movement our readers enter upon the new year to take their part in its engrossing activities and to secure for themselves, we trust, a liberal measure of the rewards of successful effort.

In looking back over such a lengthened period, notable for its progress and achievement, the attention is apt to

be attracted by the record as a whole, overlooking the fact that the great things accomplished have been the result of individual effort. There is perhaps little to suggest directly the homely but sterling qualities in those who wrought so well—the industry, the perseverance, the painstaking care and the hopefulness that refused to be discouraged by difficulty or defeat—qualities which were, however, essential factors in the accomplishment of what has been achieved. Those who are their successors, to whom is given the opportunity of continuing their work and perhaps carrying it to higher perfection, must be willing to labor with the same industry, patience and courage and to attain their end by the same commonplace pathway of hard work. This is one of the lessons, perhaps the chief one, to be learned from a thoughtful retrospect of the triumphs, whether of trade or journalism, which are recorded in this issue. The story of the life work of several men pre-eminent in the positions they occupy in the trade certainly enforces this lesson and at the same time gives to those whose spurs are still to be won the inspiration of great examples. In connection, however, with these qualities there is in the career of the most successful merchants and manufacturers evidence of resourcefulness and invention which contributed directly to their success. It was not by imitating the practices and methods of others, but by venturing on new paths that the great manufacturers and merchants attained the positions they occupy. It has been the instinct of American enterprise to follow the old paths only long enough to discover better ways. There has been in every department of activity, where anything worth the name has been accomplished, the ability or good fortune to initiate rather than to imitate. Those who possess the courage and ability to devise new methods, to work along new lines, to put on the market a new product, always supposing that these new departures justify themselves by their results, are those whose efforts are attended with the most notable success. Their experience might well be expressed in the words of the builder of ships who outstripped all his rivals:

They asked me how I did it, and I gave them the Scripture text:

"You keep your light so shining a little in front of the next."

They copied all they could follow, but they couldn't copy my mind.

And I left them sweating and stealing a year and a half behind.

The spirit of courage and hopefulness from the story of those who out of insignificant beginning and in the face of many difficulties have attained a great success; a reliance upon the homely but royal qualities of industry and persistence, and the possession of the superb ability to originate, leading rather than following, discovering and adopting new and better methods—these are lessons from the past half century which should be heeded by those who have their fortunes to make and their part to perform in shaping the course of the trade during the years to come.

Condition of Trade.

Notwithstanding the interruption of business by the holiday season it is interesting to note that already January is making a good record for itself, as liberal orders are being received by manufacturers. This is illustrated

by the experience of one of the prominent houses whose order mail on Tuesday was a record breaker. Trade, however, on the whole still feels the effect of the holidays and the turn of the year, which brings with it attention to the closing of accounts and getting things in order, rather than the aggressive carrying on of business. A very hopeful feeling pervades the trade and commercial circles generally and there are anticipations of an excellent trade unless some disturbing factor, of which there is at present no hint, should make its appearance. Some advances have been announced within the past few days and the tone of the market continues strong. Stocks generally in the hands of the trade are considerably depleted and the indications point to an early placing of orders. Export business continues in excellent volume and many manufacturers are giving careful attention to its cultivation.

Philadelphia.

SUPPLER HARDWARE COMPANY.—The year 1905 has been devoid of sensational features. No decided movement in values has marked any part of it, and yet a comparison of the inventory of this year with that of 1904 will show a very large number of lines that must be figured at higher prices. The year has been notable for the increased demand for Builders' Hardware and Mechanics' Tools, reflecting the widespread erection of homes and business structures. The enormous sales of Cutlery and House Furnishing Goods give evidence of a fully employed and well paid artisan class, as the Hardware dealer is their natural source of supply.

There has been an absence of speculative buying, and in consequence of this and the heavy demand for most lines stocks all over the country are not above normal. The unbelievable has come to pass. A year ago it was generally thought that goods were "too high" and that there must be very soon a return to former values, and while no very logical explanation could be given for the opinion it did restrict purchases to current wants and in many cases the demand caught dealers with short stocks.

It is hard to realize what a return to former values would involve or to defend the claim that prices are now too high. All values are relative. Mechanics' Tools are cheaper in relation to the wages earned with them than ever before. When did as few hours' work buy for the carpenter a Hatchet or for the mason his Trowel? And at the same time when did the Tool maker get as much for forging and finishing them? From the fellow who digs the Iron clear through to the one who employs the Tool in earning his livelihood better compensation is given, and the wonder is that the manufactured article can be sold for so little. And the farmer: when would as few eggs buy a pair of shoes, a Scythe or set of Harness for him? When would the product of his well tilled acres exchange in the markets for as much in the way of necessities and luxuries?

So who will confess that he wants to return to the good old days of low prices, when he recalls how much harder it was then to earn even the little required for necessities? We believe the relation between the earning power of the public and the price of the manufactured article does not justify the statement that the makers are getting an undue compensation. A more intimate knowledge than the general public possesses of the increasing cost of labor and materials, as well as the ever climbing item of incidental expense, will convince any reasonable inquirer that at present figures the manufacturer is not overwell paid.

We did not intend to write an apology for the Hardware manufacturer, but to draw the conclusion that if these things be so a good, full stock in store and liberal contracts for the spring and summer are very desirable assets.

The year 1906 opens with great promise of activity in every line of industry in which Hardwaremen are interested and that means pretty much the whole industrial world. There never was as much money in the hands of the spenders or a better outlook for this to continue. It may be possible that values on the tapes are too high and that \$100,000 may seem a big price to pay for a *Sto* Exchange seat before we greet 1907, but for the producer

there is every reason to believe that his product will find a good market throughout the year. So we feel justified in adding to our wish that 1906 may be a happy year the prediction that it will be a most prosperous one to all the Hardware fraternity.

Cleveland.

THE W. BINGHAM COMPANY.—We desire at this time to place on record our high appreciation of the whole *Iron Age* outfit, for the loyalty, good feeling, and good fellowship that you have extended to the Hardware trade. We believe that the record *The Iron Age* for the past fifty years has made will go down into history as that of one of the best managed trade periodicals that Americans have ever produced, for you have always tried to be square with the manufacturer, jobber and retailer in everything you had to say for or against them. We lift our glasses to you, gentlemen, and say: "May you have a long, prosperous and happy career, and may you always find yourselves, as now, surrounded by friends."

The prosperity of the American people exceeds all former good times. Corn, wheat, oats, barley, potatoes, fruits and other products of the soil have shown up splendidly. Secretary of Agriculture Wilson declares the wealth of farm products of the United States for the year 1905 to be worth \$6,415,000,000. Blast furnaces are breaking all records, for the outputs of Pig Iron, Steel and Iron products have been and are being made and sold in unprecedented quantities. In all the great industries similar conditions exist. The United States Steel Corporation has orders on its books running into an immense tonnage, aggregating 7,300,000 tons. This alone will keep its furnaces and mills at work for the greater part of 1906.

Railroad companies continue to place large orders for rails, and it is estimated that our railroads need now 300,000 new and larger capacity cars to care for the traffic offered them, as thousands of the old style cars are too small and worn out and will be relegated to the pile and therefore must be replaced as soon as possible. Locomotive works are busy turning out large and improved types of freight engines. Our lake shipbuilding companies have contracts for a number of steel freight steamers 600 feet long, with a carrying capacity of from 10,000 to 11,000 tons each.

A larger amount of iron ore from Lake Superior mines was brought down this year than in any previous year, and it is reported by those who know that they have already sold 95 per cent. of what can be mined during the coming year, or in round numbers 35,000,000 tons; and this ore is sold at 50 cents per gross ton higher for delivery in 1906 than the price obtained in 1905, and many large lake steamers are being chartered to bring this ore down from the Lake Superior mines to Cleveland and other ports, at the rate of 75 cents per gross ton. This immense quantity of ore is to be worked up by our furnaces into pigs and billets and finally into sheets and shapes of all kinds, to be consumed within our own borders or sold abroad.

To give an idea of the grain capacity of these steamers, one of them recently made a trip from Duluth to Buffalo carrying 235,000 bushels of wheat, for which the shippers paid 4 cents a bushel, or in round numbers the steamer got \$9400 for a trip one way. Our foreign or export trade is of unprecedented volume.

Now let us stop and think what an immense amount of money must be paid out for labor from start to finish, to keep this immense traffic moving.

The general Hardware trade in all its branches is in fine condition and we advise our friends to place their orders at present prices for immediate shipment or early in 1906, particularly for Common, Silver Finish and Bronze Metal Screen Wire Cloth, Poultry Netting, standard grade of Hardware Cloth, Lawn Mowers, Scythes, Snathes, Rubber and Cotton Hose, Shovels, Spades, Steel Manure and Hay Forks, Garden Rakes and Hoes, Screws and Butts, Hinges, Bolts, Builders' Hardware, Black and Galvanized Sheets, Tin and Roofing Plates, and as many other spring goods as they can induce their jobber friends to cover them on, for if they place their orders with the right house they will thank us for this advice later on.

The general outlook for business for the coming year is certainly very propitious, and we do not hesitate to advise our friends to "clear their decks," sort up their old stock and where they are low on season goods buy now at present prices and be prepared for the splendid trade that must come to all those who understand their business thoroughly and "hustle while they wait."

We thank all of our many friends in the trade for the splendid business they have given us during the past year and assure them that we are theirs to command at all times. We wish them, one and all, a very prosperous and happy New Year from first to last.

Nashville.

GRAY & DUDLEY HARDWARE COMPANY. — Santa Claus has made his annual visit and we hope that all of our friends in the Hardware trade have found their stockings bountifully filled.

The retailers who carry a nice line of holiday goods have certainly been able to finish the year's business with a rush, as the trade on holidays goods in the South was never so good before as it has been this season. While 1905 gave the Hardware dealers some adverse conditions to contend with, taking it altogether it has been a good year for business. We started in January with low priced cotton, but a bountiful crop of other farm products, sold at good prices, enabled the dealers to maintain the ruling prices on Hardware, notwithstanding that during January and February the weather was so bad that trade was necessarily dull. The late spring trade was much better, the summer and early fall trade was interrupted by the outbreak of yellow fever and consequent quarantine regulations, after which we had smooth sailing for the remainder of the year.

While it is true that agriculture is the basis of prosperity, especially in the South, it is also true that the mining and manufacturing interests are rapidly becoming factors to be considered in this connection. The 1905 cotton crop was not a large one, but was sold at remunerative prices, and all other farm products having brought handsome prices the horny handed tillers of the soil are out of debt as a general rule and in an independent position. They are not only making a living, as has been the custom for many years, but the majority of them are accumulating property.

The manufacturers of the East and North are, many of them, looking over the South for locations, and our cities, which have the right kind of inducements to offer them, such as fine transportation facilities, good class of labor at reasonable prices, healthful location, excellent schools, &c., are enjoying a boom in their manufacturing interests. Our own city has received her full share of this prosperity since the purchase of the Tennessee Central Railroad by the Illinois Central and Southern railroads, thus admitting both of these great systems into our city at the same time. The new branch of the Southern Railway Company into Nashville is developing one of the best coal fields in the South, until recently untouched.

People who are seeking investment in manufacturing and mining industries have learned to consider very seriously the question of labor and are trying to invest their money in localities where they will not be harassed by unreasonable demands of labor unions. The white people of the South being largely native Americans have never gone to extremes in the matter of organized labor, and our colored brother when industrious has usually not been hard to control. We can now see that the conservative course of the people in our section of country in this respect is bearing fruit.

The fall trade in this section has been quite satisfactory, we believe, to both retailer and jobber. The scarcity of raw material, with the strong demand for Hardware which is necessary to supply an increased consumption at home, together with the increased export trade, insures a steady market.

Prices are being well maintained, collections are good and every one with whom we have talked is confident of a splendid business for 1906.

Portland, Oregon.

CORBETT, FAILING & ROBERTSON. — The centennial year, as 1905 will be known in the old "Oregon" country, comprising the territory now known as Oregon, Washington, Idaho and Montana, will go down in history as one that

brought prosperity to nearly every fireside where an earnest and honest effort was made to entitle one to its benefits. True, every industry or branch of industry has not prospered alike, as is always the case, but the average outcome should bear out above statement.

In farming our staple crop wheat has turned out an immense yield as a whole, although a partial failure in some sections and price is far short of what it was for preceding crop. On the stock ranges conditions have been more favorable than for years past. The weather has been favorable in every particular and demand and prices for cattle and sheep were better than for any time in the past three years. Wool brought phenomenal prices. The only industry that suffered was hops, as the price has ruled very low for this year—in fact, close to cost of production. However, this industry has been favored with high prices for three seasons and should be able to stand a reaction.

Our mining interests are still in a dormant state. There is no question that the metals are there in Gold, Silver, Copper and Iron, but the confidence of a long suffering public has been so abused in the past that capital to exploit and develop is not available in this promising industry.

Turning to the timber and lumber interests we can report a much better feeling and condition during the past year, with brighter prospects for the future than for several years past.

Forecasting the future, the outlook is good. Railroad construction, both in hand, ready to contract and in contemplation, is on a scale never before carried on in the Pacific Northwest. Building operations in city, both for office, business and residence purposes, goes on as heretofore reported.

The season so far as weather is concerned has been all that could be wished for in all outdoor operations. Roses are blooming in gardens and grass growing on lawns, although we are in the same latitude as Montreal.

The Lewis and Clark Exposition is a thing of the past, like a beautiful dream or a pleasant memory, but the resulting good should continue for many years. The impression on 100,000 Eastern visitors must have been of a most favorable nature and should result in an increase of population throughout this entire section.

Hardware sales during the past year show a handsome increase over 1904, and if 1906 shows corresponding increase we should all be satisfied. Collections have been better than at one time they promised, so that books January 1 will be opened with smaller balances transferred than for several years past.

We wish to congratulate *The Iron Age* on its golden anniversary and to hope its future circulation and influence for good will increase in the same ratio in the future as it has in the past 33 years that the writer knows it has from personal perusal.

Omaha.

LEE-GLASS-ANDRESEN HARDWARE COMPANY. — After having enjoyed a record breaking holiday trade business has settled down to the usual midwinter schedule. The record for 1905 shows a very large volume of business transacted, and the results indicate a healthy growth with commensurate benefits.

It is expected that a season of comparative quiet in business circles will intervene between now and the opening of the spring campaign. This of course is customary. The general feeling, however, of business men throughout the trans-Missouri region is one of uniform confidence, and the conviction prevails that all conditions point to a heavy volume of business which will continue at least until the new crops begin to attract attention.

The recent advances in prices of raw materials and the basic products have stimulated trade already to a certain extent, and it is believed by many that a higher range of values is not at all unlikely.

The condition of the entire Western country may be stated as one of healthfulness, progression and prosperity. Never in its history has it enjoyed such an independent financial position. A series of years of immense crops at remunerative prices has placed producers out of debt, leaving a handsome surplus for future enterprises, and for this reason general business has flourished continuously, and in all probability will continue to increase.

St. Louis.

NORVELL-SHAFFLEIGH HARDWARE COMPANY.—Fifty years is a long, long time. The personal experience of the writer, as an "ironmonger," extends back only 25 years. Before that trade facts come down in the dim form of traditions.

On an anniversary occasion one naturally becomes retrospective, but for reasons given we can go back only a quarter of a century. We will leave it to the older and wiser members in the trade to carry the story back to 1856—the date *The Iron Age* was established.

As late as 25 years ago salesmen were selling goods from pencil made price books. A real modern, up to date price book had a few clippings of the goods inserted between the price pages. Each salesman with great care and many errors made up his own price book. The modern price printed, loose leaf catalogue was a thing not even dreamed of.

Typewriters were unknown. Letters were written by hand. They were long and courteous to the customer and brief and emphatic to the salesman. I can recall the first letter I received as a salesman. It began, "You start out full of errors." Invoices were also hand written. The idea of economy in those days made it customary to write on both sides of the same sheet in order to save paper and postage.

Where the railroads now gridiron all parts of the Far West salesmen in those days traveled on horseback with saddle bags, by stage and sleigh. The pampered salesman of to-day feels aggrieved if some slow customer prevents his spending every Saturday evening with his family, while in those days jobbers' salesmen thought nothing of trips that consumed from three to six months.

Salesmen accompanied their orders with long letters giving the personal history and financial responsibility of their customers. Credit was based almost entirely on these reports. While these old-time salesmen also collected thousands of dollars for their firms their personal integrity was of the highest, and losses on account of dishonest salesmen were few and far between.

Thousands of towns are now on the map which in those days were still in the bosom of the future. Large and prosperous cities of to-day were then nothing but hamlets. Territories have become States, wild lands have become territories.

To-day our stores are crowded with women clerks. In those days a woman employee in a Hardware house would have been a curiosity. The up to date Hardwareman chewed tobacco, swore and drank whiskey to his heart's content. Some of the best traveling salesmen were a wild, drinking, gambling lot, but their sense of personal honor and its obligations was keen.

When the country merchants came to town on their annual visits there were "high doings," and often have I seen a salesman in a sample room hold up his customer with one hand while he wrote down his order with the other.

The former generation of bosses tell us how hard they worked, but unfortunately we of the younger generation remember long intermissions when they were absent from the store. We remember when the pair of trotters was regularly brought around to the front door at 4 p.m., and the "boss" started out for the park to take his afternoon drive, or if the weather happened to be bad how he went up to the club to spend a couple of hours playing pool before he went home to "supper"—not dinner as we now say.

They did work hard in those early days in certain months in the spring and fall, but nowadays we modern degenerates are compelled to work hard all the year round. They had breathing spells, but with us the pressure is incessant.

Then there were no telephones, either local or long distance, and a man could do his work in peace. There was nothing but the most simple plumbing. Modern sanitary toilet rooms were unknown. In all the stock departments the boys worked or froze, as there was no steam heat.

Such a thing as a vacation or closing early on Saturday was unknown, therefore not missed. The hours for work were long, and night work in the busy months the regular and expected programme.

Goods were tied up in paper packages; the wooden dovetail box was still to come. The more grease on the goods the better. Boxing and drayage were a source of profit.

Many customers bought on a year's time, and "what terms will you give me?" was more often heard than "what are your prices?"

Every youth making his debut in the business world was introduced to the letter press and the copying book as his starting point. Carbon copies and upright filing systems were unknown. The Jones and the Smiths were not divided by States and towns, but all mingled fraternally together under the letter "J" or "S."

The Western jobber looked forward to his annual visit to New York for rest and relaxation, and when he returned home indulged in many a sly wink when he told the story of his trip to his fellow merchants.

Those were great and glorious days in the Western Hardware trade. There was plenty of room for all and no one had pre-empted the earth. The rough and ready freedom of the times developed a strong breed of men; friendships were deep and lasting, and it sometimes seems to me that in the smoothness and polish of these modern days we miss the ruggedness and strength of the days of old. Nevertheless we live and work in better times. The old days and the old opportunities were mean and narrow as compared with the broadness and sweep of the possibilities of the twentieth century merchant.

All of us join most sincerely in extending our congratulations to *The Iron Age* on its fiftieth anniversary. If time proves all things, then surely it has proved that *The Iron Age* was builded on a rock and not on sand. It is a paper of character and principle. It commands the confidence, respect and admiration of the Hardware trade, not only in the United States, but in all parts of the world. In its dignity and fairness, even in criticism, it should stand as an example to the trade press of this and all countries.

One cannot help but feel in reading its columns from week to week and from year to year, that the basis of its management is that of the character of the Christian gentleman. Keeness tempered with gentleness. Criticism with good nature. Justice with charity.

In considering the well-merited success of this trade paper I am reminded of the words of Emerson:

"If a man can preach a better sermon, write a better book or build a better Mouse Trap than his neighbor, though he build his house in the wood all the world will make a beaten path to his door."

Boston.

BIGELOW & DOWSE COMPANY.—We extend to *The Iron Age* New Year's greetings and congratulations on its fiftieth anniversary. Your interests are so closely interwoven with the iron industries and the Hardware trade that we feel that your success is ours, and we don't want you to forget the reciprocity that each owes to the other.

On general principles the trade has but few complaints of your position in the past, but there are times when you have seemed to be a little inconsiderate of the jobbers and stirred them up unmercifully. We are all liable to be a bit bilious at times, and those of us who know your genial editor are ever ready to look upon an occasional outbreak with kind consideration and sympathize with him in his weekly task of having to write an editorial and when for lack of other material he gives his old friend the jobber a bit of scoring from his caustic pen. These diversions come so seldom, however, that we can only forgive and forget.

The past year has added more wealth to the country than any preceding year, and unless all signs fall everything is in line to make 1906 still more prosperous. Conservatism on the part of large producers of raw material have held prices in check, so that values of manufactured goods have been firm without any undue advances. An inventory of stock of Hardware taken to-day and compared with the same stock of a year ago would be very near the same.

Considering the scarcity of pig iron and copper and the necessary advances there are unmistakable indications of a higher range of prices in the immediate future and that they will undoubtedly be maintained well into

the fall of 1906. Benner prophesied in 1904 the conditions as they existed the past year, "a revival of trade, better times and higher prices, that would prevail until 1911."

Every section of the country has been favored with large crops, which are selling at record prices, taxing the transportation facilities to the limit. The results of several favorable years have made the farmers rich and forehanded. If they do not like the ruling prices for their crops they hold them for more favorable conditions. The basis of the present market is strong and should be lasting.

The past year has been comparatively free from strikes and labor troubles. The demand for goods has kept the mills of the country fully occupied and used up all surplus stocks. A large manufacturer of general Hardware said if his production was one-third greater than at present he would not be able to supply the demand.

The holiday business has been exceptionally good. The demand for Skates has demoralized the stocks of the jobbers as well as the factories. A lack of snow has interfered with the sale of Sleds, while the destruction of a Snow Shovel factory has made a shortage in the stock of Snow Shovels.

General business has been prosperous throughout New England, and there is nothing in the present outlook to interfere with its continuance.

St. Paul.

FARWELL, OZMUN, KIRK & Co.—We write these lines in the closing days of 1905 with the feeling deeply intensified that to the country generally it has been one of the most prosperous years during the half century's existence of *The Iron Age*.

This is true not only as to the different classifications in business and avocations in life but also to all sections of our country. Prosperity has never been more widely or evenly distributed than it now is throughout the land and we may reasonably expect never to see fewer or less important exceptions to these general conditions than now exist.

Throughout the whole country factories and mills are crowded with orders, labor is fully employed, railroads are unable to meet their requirements, and of course, as the foundation of all this prosperity, crops are abundant and bring good prices. The South has not fared so well as most other sections, but it is still in good condition and goes hopefully into the new year.

The uppermost question now is: "How long are these favorable times likely to last?" No one can answer. Benner predicts that they will continue till 1911, when they will begin to harden. But Benner is not infallible, and for the most part the rest of us can guess about as intelligently and authoritatively as he can. We all understand that there are certain general as well as some local causes at work which naturally lead us to expect a continuance of prosperity for some time ahead, unless interfered with by loss of crops at home or unfavorable foreign conditions. But so long as these and other contingencies exist (and they always will exist) we can only guess as to the distant future.

We do know this, however: that the general conditions are now very favorable for a continuance of prosperity and with fair crops we may reasonably expect to find 1906 another good year. This is true of the Northwest and, we believe, of the country generally. To help to insure continued prosperity to the country generally we believe that every intelligent, fair minded man must see that the time has come when the great question of commercial reciprocity must have full consideration and definite action by Congress.

Thus far Congress has been much too slow about it. Valuable time and opportunities have been lost. The interests that have been standing in the way should now see the handwriting on the wall and realize that the people are determined that necessary action must be taken to extend our foreign markets.

Baltimore.

CARLIN & FULTON.—The annals of 50 years' experience in the Hardware trade, whether those of the trade journal or the mercantile house, are records of most wonderful change, growth and improvement in one of the

greatest industries known to civilized man, and which, by furnishing the Implements for agriculture, the Tool for the mechanic, machinery for manufacturing and material for means of transportation, has kept in touch with the expansion of our country in territory, its increase in population, the necessities of its domestic markets, looking out also for the markets of the world.

The half century just completed has seen developed in *The Iron Age* the highest type of the trade journal, which on account of the greatness of its scope, its statistics compiled most accurately, its able editorials and its general progressiveness and influence is a publication in which we can all take pride as being of and belonging to our guild.

A review of the twelve months just ended has shown that whereas the year began most auspiciously the extraordinary weather conditions which prevailed for nearly eight weeks during the winter and early spring almost paralyzed business in certain sections which were covered by ice and snow, but soon trade revived with the change in weather and throughout the balance of the year has been marked by the greatest activity in every direction.

Agricultural products, which form the basis of nearly all business, have been large and the selling prices such that the average farmer has never had so much per capita to spend as at the present time. The billions of dollars which are in circulation arising from the sale of the great agricultural staples, with the immense sums appropriated for municipal and national improvements, and the vast sums being spent by the railroads for betterments, are taxing the greatest capacities of our manufacturing industries and giving employment to every man who can and who desires to work.

These are the reasons for optimism in the outlook as to the future of business and it would seem that there should be no reason for any other expectations than those of continued prosperity.

In looking at the brightness of the future we must not forget, however, that in a review of 50 years business there are many lessons to be learned, one of which is that conservatism is frequently a virtue and that there is a great difference between legitimate enterprise and mad speculation, and also the ambition for monopoly and expansion, whether in manufacturing or distribution, sometimes results in unexpected disaster. The conditions today are such that were the great manufacturing interests of the country managed with less wisdom and less foresight and care as to future results we could easily have a market soaring in prices to figures beyond reason, as happened but a few years ago; but fortunately there is a conservatism in control which so far has prevented such a condition.

In evidence of the great development of the South alone it is well to note the following statistics taken from the Comptroller's report for the present year:

National banks from Maryland to Texas in 1905...	1,221
National banks from Maryland to Texas in 1880...	220
Increase in 25 years.....	1,001
Capital of National banks from Maryland to Texas in 1905.....	\$126,037,000
Capital of National banks from Maryland to Texas in 1880.....	45,598,000
Increase of capital in 25 years.....	\$80,439,000
Surplus of National banks in 1905.....	\$50,257,000
Surplus of National banks in 1880.....	9,000,000
Increase of surplus in 25 years.....	\$41,257,000
Deposits in National banks from Maryland to Texas in 1905.....	\$469,032,000
Deposits in National banks from Maryland to Texas in 1880.....	64,729,000
Increase of deposits in 25 years.....	\$404,303,000

In closing we desire to congratulate you on your semi-centennial, which by coincidence is also our own fiftieth anniversary, and we wish you in the future as great a success as you have realized in the past.

NOTES ON PRICES.

Wire Nails.—In view of the comparatively low stocks in the hands of jobbers at this time of the year, an unusually large volume of business has been booked by the mills for January and February delivery. Scarcity of steel and shortage of cars delay shipments and interrupt

shipments from mills to some extent. Quotations are as follows, f.o.b. Pittsburgh, plus actual freight to point of delivery, 60 days, or 2 per cent. discount for cash in 10 days:

Carloads to jobbers.....\$1.80
Carload lots to retail merchants..... 1.85
The market has a strong tone and there is reason to expect the announcement of an advance in the near future.

New York.—Owing to interruption of business by the holiday season and stock taking merchants are restricting their orders to actual necessities, which are comparatively small. A good many merchants have, however, given contract orders for delivery during January and February. Quotations for small lots from store are on the basis of \$2.05.

Chicago, by Telegraph.—Both distributors and consumers are surprised that no advance was announced with the advent of the new year, especially in view of the large tonnage closed during December for January and February delivery and the high prices now prevailing for raw materials. During the week large contracts were booked in anticipation of advanced quotations and specifications on contracts previously placed exceeded former high records. Stocks in the hands of jobbers and dealers are low, and owing to the heavy consumption the last few months the mills have been unable to accumulate ordinary warehouse stocks. Quotations are unchanged, as follows: \$1.95 in car lots to jobbers and \$2 in car lots to retailers, with an advance of 5 cents for less than car lots from mills.

Pittsburgh.—The jobbing trade continues to place heavy contracts for Wire Nails in anticipation of a possible advance in prices, which may come before this month is out. The high prices of steel and rods, together with the heavy demand for Nails, which has prevailed for some time, would seem to warrant higher prices on Wire Nails. Output and shipments of Wire Nails in 1905 were very much larger than in 1904. The mills are still having trouble in getting steel promptly, and the supply of cars is short at times. We quote Wire Nails at \$1.80 in carloads to the largest jobbing trade and \$1.85 in carloads to retail merchants, f.o.b. Pittsburgh, plus actual freight to point of delivery, terms 60 days, less 2 per cent. off for cash in 10 days.

Cut Nails.—Demand is fairly active with the mills depending somewhat upon the territory to which they are tributary. Mills are continuing the policy of restricting output to actual requirements to prevent an accumulation of Nails. Quotations are as follows: \$1.75, base, for carload lots, f.o.b. Pittsburgh; \$1.80 for less than carloads, f.o.b. Pittsburgh; \$1.90 for carload lots, on dock, New York; \$1.95 for less than carloads, on dock, New York. Iron Cut Nails at points west of Buffalo and Pittsburgh are held at 5 to 10 cents advance on Steel Cut Nails.

New York.—Local demand is moderate, being restricted to actual requirements. Quotations for small lots from store are on the basis of \$1.95 to \$2 per keg.

Chicago, by Telegraph.—Demand is heavy and inquiries are coming in large volume. Prices are firmly held. We quote Steel Cut Nails at \$1.90 to \$1.95 in car lots and Iron Cut Nails \$2 to \$2.05.

Pittsburgh.—It is stated that the recent advance of 5 cents per keg in price of Cut Nails is being firmly maintained and that one or two mills in the Wheeling district that are outside the association are quoting \$1.80 at mill. The market is very firm and demand is larger than usual at this season of the year. Quotations are as follows: \$1.75, base, for carload lots, f.o.b. Pittsburgh; \$1.80 for less than carloads, f.o.b. Pittsburgh; \$1.90 for carload lots, on dock, New York; \$1.95 for less than carloads, on dock, New York. Iron Cut Nails at points west of Buffalo and Pittsburgh are held at 5 to 10 cents advance on Steel Cut Nails.

Barb Wire.—Demand is seasonable and consequently light in the way of new business being placed with the mills. They are, however, busy filling specifications on contract orders and accumulating stocks for spring demand. Quotations are as follows, f.o.b. Pittsburgh, 60 days, or 2 per cent. discount for cash in 10 days:

	Painted.	Galv.
Jobbers, carload lots.....	\$1.95	\$2.25
Retailers, carload lots.....	2.00	2.30
Retailers, less than carload lots.....	2.10	2.40

An advance of probably \$1 a ton is looked for at any time.

Chicago, by Telegraph.—The consumption of Barb Wire has been unusually heavy on account of the favorable weather which has prevailed throughout the West and Northwest and which permitted much outside work that is usually deferred until spring. In consequence jobbers are generally low and heavy specifications are being received on existing contracts. Quotations remain unchanged: To jobbers, Chicago, car lots, Painted, \$2.10; Galvanized, \$2.40; to retailers, car lots, \$2.15; Galvanized, \$2.45; retailers, less than car lots, Painted, \$2.25; Galvanized, \$2.55; Staples, Bright, in car lots to jobbers, \$2.05; Galvanized, \$2.35; car lots to retailers, 10 cents extra, with an additional 5 cents for less than car lots.

Pittsburgh.—Demand for Barb Wire is much heavier than usual at this season of the year, due to the fact that stocks of jobbers are low and to the expected advance in prices, which may be made before this month is out. Orders for spring trade will soon be placed and the outlook is very satisfactory. We quote Painted Barb Wire at \$1.95 and Galvanized at \$2.25 in carload lots to the large jobbing trade, with the usual advance of \$1 a ton to retailers in carload lots, f.o.b. Pittsburgh, 60 days, or 2 per cent. off for cash in 10 days.

Smooth Fence Wire.—The mills are operating to their full capacity filling specifications on contract orders, besides receiving a fair amount of new business. Quotations are as follows, f.o.b. Pittsburgh, 60 days, or 2 per cent. discount for cash in 10 days:

Jobbers, carloads.....\$1.65
Retailers, carloads..... 1.70

The foregoing prices are for base numbers, 6 to 9. The other numbers of Plain and Galvanized Wire take the usual advances, as follows:

	6 to 9	10	11	12	12½	13	14	15	16
Annealed.....Base	\$0.05	.10	.15	.25	.35	.45	.55		
Galvanized....	\$0.30	.35	.40	.45	.55	.65	1.05	1.15	

Chicago, by Telegraph.—The present tremendous consumption is indicated by the heavy specifications which reach the mills from day to day. As the requirements of all large consumers were covered by contract early in the fall new business is consequently light. Quotations are unchanged, as follows: \$1.80, f.o.b. Chicago, in car lots, and car lots to retailers, \$1.85.

Pittsburgh.—New tonnage being booked by the mills is larger than usual at this season of the year and specifications on contracts are coming forward very freely. Fence manufacturers are placing liberal orders and the outlook is that spring trade will be very heavy. Quotations are as follows, f.o.b. Pittsburgh, 60 days, or 2 per cent. discount for cash in 10 days:

Jobbers, carloads.....\$1.65
Retailers, carloads..... 1.70

The above prices are for base numbers, 6 to 9.

Hot Pressed Nuts.—In accordance with the revised list prices on base sizes of Hot Pressed Nuts, announced last week to take effect January 1, the lists on Nuts for 1-inch and 1½-inch Bolts has been changed to read as follows:

	Blank.	Tapped.
United States Standard List, Square...	8.40	8.80 per 100 lbs.
United States Standard List, Hexagon...	9.90	10.50 per 100 lbs.
Manufacturers' Standard List, Square...	8.30	8.70 per 100 lbs.
Manufacturers' Standard List, Hexagon...	9.80	10.40 per 100 lbs.

Further examination of the new list of Nuts with enlarged holes, given in full last week, develops the fact that Hot Pressed Square Nuts with holes 1-32 larger than United States Standard are listed in such list 10 cents per 100 pounds higher and Hexagon 15 cents per 100 pounds higher.

Russell & Erwin Mfg. Company.—Russell & Erwin Mfg. Company, New Britain and New York, has made a number of advances on staple lines. One sheet advances Chisels, Drawing Knives and certain Auger Bits about 10 per cent. Another circular, covering five pages, relates to an advance of approximately 10 per cent. on Builders' Hardware under date of January 1, 1906. Japanned Tumbler Padlocks, Padlocks in sets, with Master Key, and Padlock Keys are also advanced 10 per cent. The company likewise has withdrawn prices on Builders' Hardware in force prior to January 1, 1906 and advanced

the line on an average 10 per cent., as referred to elsewhere.

Builders' Hardware.—The leading manufacturers of Builders' Hardware, working in harmony, as has been their custom for a term of years, have withdrawn prices on these goods existing prior to January 1, 1906, and have advanced prices approximately 10 per cent., there being some greater advances on certain goods. In the main, however, 10 per cent. is a fair average. It will be recalled that two years ago, January 1, 1904, a 10 per cent. advance was made and that in the following November a discretionary rebate of 10 per cent. was allowed which virtually nullified the former increase. In March, 1905, the rebate was withdrawn, which left the prices of January, 1904, in force. On contract goods the manufacturers announce that until February 1, 1906, orders will be accepted based on schedule estimates furnished manufacturers prior to January 1, 1906, provided that each order covers a complete specification for the goods and states the name and location of buildings for which the goods are intended. On and after February 1, 1906, all schedule estimates then outstanding will be abrogated and no further schedule orders will be accepted except on the basis of January 1, 1906, prices.

Henry Disston & Sons.—Under date January 1, 1906, Henry Disston & Sons, Philadelphia, issue the following discount sheet, in which it will be observed a number of changes in discount are announced:

	Discount.
Inserted Tooth Saws, Points and Holders; Rift Saws; Inserted Tooth Saws and Teeth (American Saw Company's pattern); machine for sharpening inserted teeth; Solid Tooth Circular Saws; Circular Saw Repairs; Shingle Saws; Segment Veneer Saws and Repairs; Circular Miter Saws; Concave Saws; Grooving Saws; Cork, Paper and Cloth Knives; Circular Milling Saws for Newton and other Milling Machines; Circular Saws and Disks for hot or cold metal; Circular Slate Saws.	50 %
Screw Slotting Cutters; Metal Slitting Saws.	50 %
Circular Milling Saws for "Bryant" and "Higley" machines.	50 %
Mill and Mulay Saws; Gang and Deal Saws; Pit, Whip and Futtock Saws; Tiller Handles; Pond and Hand Ice Saws; Drag Saws.	50 %

Cross-Cut Saws.

Tenon, Plain and Tuttle Tooth; Lumberman, Diamond and Fleam Tooth; Lancet, Perforated Champion and Perforated Lance Tooth; Electric, No. 1 and No. 2 Great American Tooth; Champion and Oriole Tooth; Novo, International and International Felling Saws; No. 1 Felling, Oregon and Oregon Perforated Tooth; Humboldt, California, Toledo Blade and Sabine Saws; Vim Champion and heavy Lancet Sterling and Nevada Saws; Nevada Perforated and Pacific Tooth.	45 %
"Triumph" or Narrow, Champion, Great American and Toledo.	50 %
One-man Champion X-Cuts; One-man Champion (Key-stone); One-man Great American; One-man Perforated Lance; One-man Lumberman and Ideal.	45 %
Cross-Cut Saw Handles; Cleaner Tooth Gauges.	50 %
Universal Cross-Cut Saw Tool; Saw Mandrels and Speed Indicator; Saw Gummers and Cutters; Band Saw Swage; Gumming Press and Hand Shear Swages; Swage Bars, Hammers, Setting Stakes and Straight Edges; Saw Sets; Slide Files; Saw Clamps and Filing Guide; Hand Saw Jointer; Wire Gauges and Nail Gauge.	30 %
Band Saws, 2 inches to 18 inches wide.	60 %
Band Saws, 1/4 inch to 1 3/4 inches wide.	60 %
German Web Saws; Turning and Fay Webs; Felloe and Canadian Webs; Gin Roller and Doctor Blades.	30 %

Hand Saws.

Nos. 112, 12, 99, 9, 16, D-100, D-8, 120, 76, 77 and 8.	30 %
Nos. 7, 107, 107 1/2, 3, 1, 0, 00, 82, 86, 90 and 91; Combination Saws.	35 %
Gauge Saws, Ship Saws and Cabinet Scrapers; Compass and Keyhole Saws; Pattern Makers', Dovetail, Turkish, Stairbuilders' and Pole Pruning Saws; Pad Keyhole and Coping Saws; Pruning Saws; Plumbers' and Joiners' Saws; Framed Pruning Saws; Back Saws.	30 %
Wood Saw Blades; Framed Wood Saws, Wood Saw Frames and Saw Bucks.	40 %
Wood Saw Rods.	25 %
Butcher Saws, Dehorning Saws and Saw Knives; Kitchen Saws; Butcher Saw Blades.	40 %
Hack Saw Frames.	30 %
Disston's Concave Ground Hack Saw Blades.	30 %
Keystone, Flexible Back and Machine Hack Saw Blades.	40 %
Plastering Trowels.	25 %
Brick, Pointing and Gauging Trowels.	30 %
Garden Trowels; "Standard" Brand Trowels; "Quaker City" Brand Trowels; Coke Trowels.	35 %
Cane, Corn and Hedge Knives; Post Hole Diggers; Pruning Hook and Saw; Saw Handles and Screws; Machinists' Rules, Squares, Bevels, Levels, Gauges and Straight Edges.	30 %
Try Squares and Bevels; Mortise Gauges; Screw Drivers, Handles and Ferrules; Shafting and Pocket Levels; Plumbs and Levels; Trammel Points and Plumb Bobs.	70 %
Slaw Cutters, one and two knives; Vegetable Cutter, Corn Graters and Potato Shredders.	40 %
Crout Cutters, 24 x 7 inches, 26 x 8 inches, and 30 x 9 inches.	55 %
Crout Cutters, 36 x 12 inches and 40 x 12 inches.	40 %
Adjustable Crout Cutters, 24 x 7 inches, 26 x 8 inches and 30 x 9 inches.	55 %
Adjustable Crout Cutters, 36 x 12 inches and 40 x 12 inches.	40 %
Superfine Files.	50 %
Files and Rasps, list of November 1, 1899.	75 %

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FIFTY YEARS' REVIEW OF THE HARDWARE TRADE

BY AN OLD HARDWARE MERCHANT.

FIFTY years ago Gen. Franklin Pierce was president of the United States, Commodore Perry had just made his famous treaty with Japan, the fillibuster William Walker had proclaimed a republic in Sonora and Baja, Cal., the Kansas anti-slavery battles were on and the writer was the American traveling agent for several of the largest Hardware and Cutlery houses in Birmingham, Wolverhampton and Sheffield. At that time there was but little Hardware manufactured in the United States; we imported almost everything except Heavy Wire, Cut Nails and Cast Iron goods.

HARDWARE TRADE IN THE FIFTIES.

The method of doing business was to carry half a dozen trunks about the country laden with samples and solicit orders for importation, the terms of credit being four or six months from date of invoice in England. As the transportation from Birmingham or Sheffield to the shipping port, together with the sea voyage (the latter being usually made in sailing ships) took six weeks, and detention at the New York custom house two weeks more, the terms were practically two and four months; but of course we did not bring this into prominent view when soliciting trade.

Besides the samples employed on the road we had large showrooms in the Beekman street neighborhood filled with a much more ample range of samples, including such heavy goods as Anchors, Chains, Cables, Anvils, Sledges, Vises, Tools, Hollow Ware, Japanned Ware and a thousand other items too ponderous or cumbersome for the drummer to carry, but convenient to show to those out-of-town merchants who personally visited New York. These goods the traveling agent sold by illustrated catalogue.

Besides Hardware the Birmingham and Sheffield houses of that period supplied other goods, which, though not strictly included in Hardware, were commonly sold by country Hardware dealers. Among these were Needles, Fish Hooks, Skates, Silver Plated Ware, Sterling Silver and German Silver Watches, Portable Mahogany Desks or Writing Cases and a great variety of wares which are now sold by jewelers. However, our main reliance was Cutlery, both pocket and table, Razors, Scissors, Files, Fine Wire, Tea Trays, Anvils, Vises, Sporting Guns, Hollow Ware, both enameled and tinned, and Edge Tools, Saws and Butcher Knives.

WOOD SCREWS AND JOSEPH CHAMBERLAIN.

Previous to this date our house had been accustomed to sell Wood Screws in America, but about this time some ingenious Yankee invented Gimlet Pointed Screws, a company in Providence began to manufacture them and they proved to be so superior to the old-fashioned ones that the latter, like bed warmers and bidet pans, fell into disuse and could no longer be sold.

Moreover, a young man of about my own age came over from England and bought up the inventor's right for this device in Great Britain. He was a member of the firm of Nettlefold & Chamberlain, and if I am not mistaken is the same person who has since become one of England's greatest statesmen and who has emphasized and confirmed his interest in American affairs by marrying an American lady.

IMPORTATIONS OF FOREIGN HARDWARE.

Omitting Plated Wares, Paints, Window Glass, Gun Powder, Glue, Wooden Wares and many other items then sold by Hardware dealers, the strictly Hardware importations of that period amounted to about \$12,000,000 a year, of which the articles enumerated in the custom house entries constituted about three-fourths, and the non-enumerated one-fourth. Among the former the principal articles were Cutlery, \$2,000,000; Sporting Guns, \$660,000; Chain Cables, \$650,000; Sheet Zinc, \$400,000; Fish Hooks and Tackle, \$250,000; Nails, Spikes,

Tacks, &c., \$220,000; Wire, \$150,000, and Anvils, Anchors, Files, Copper Wares, Tin Wares, Japanned Wares, Britannia Wares and Grindstones, each amounting to about \$100,000, these items constituting nearly two-thirds of the enumerated list.

NO MAIL ORDER TRADE.

From 1855 to 1861, when the Civil War broke out, was a halcyon period for the class of houses I represented. The orders were large, the profits remunerative and the payment prompt. We were supposed to sell upon a commission of 5 per cent., but in fact we had methods of buying goods which enabled us to more than double this rate of profit, and in some instances, especially in Sporting Guns, Pocket Cutlery, Scissors, Razors and Japanned Wares, to realize a profit of 25 to 30 per cent.

There were no facilities for our customers to buy in small lots. The country merchant laid in six months' stock, and in remote places a year's stock ahead. The Eastern importers and jobbers would sell what was then considered small lots, such as a two or three dozen package of Table Knives and Forks, or a dozen, perhaps half a dozen, Pocket Knives, Scissors or Razors, or a quarter of a dozen each of a line of Sporting Guns, all at a profit of 30 to 50 per cent; but the Birmingham and Sheffield houses never broke packages. We usually sold by the gross or the dozen, so that our invoices often amounted to very considerable sums.

DOMESTIC HARDWARE TRADE.

The domestic Hardware trade was just emerging into existence. There were one or two Wire Drawers, one or two Connecticut Cutlers, a few manufacturers of Builders' Hardware and here and there a small concern that placed invoices of Wool Cards, Machine Made Files, Steel Skates and Cast Iron Novelties. The only large manufacturer and jobber of American Hardware that can now be recalled was the Russell & Erwin Mfg. Company. The largest jobbers of foreign Hardware (German) were Hermann Boker & Co. Both of these houses are still in business. Another large jobber of foreign Hardware (French) was Lalanc & Grosjean. Windle & Co. of Maiden lane had the cream of the English jobbing trade, but none of these houses could touch the great English commission and importing houses of Harold & Co., Irving Van Wart & Co., or Blunt & Goddard, or the agents of Wade & Butcher, Spear & Jackson, Hunter & Co., Wostenholm or Rodgers. They furnished the finest goods and sold by far the largest invoices, especially the commission houses.

INFLUENCE OF THE WAR.

But the war changed all this, not only because it compelled the imposition of a higher tariff, but also because it led to immense orders from the Government, and by dropping the Southern States from the Civil and Miscellaneous Appropriation bills it diverted large sums of money into Northern and Western channels, where they promoted railroad and telegraphic concentration, encouraged express companies and greatly altered the facilities for ordering and transporting small packages of goods.

The Western merchant who formerly had to wait 30 to 60 days for a case of goods, and therefore in order to keep up his stock had to lay in several months' supplies at once, could now confidently expect to get his goods within, say, a fortnight of the time they were ordered. This naturally led to a preference for American Hardware, provided the price was not altogether prohibitive.

The foundation of many American houses, supposed to be due to legislative encouragement, was really due to these and other circumstances having no connection with the tariff. The railroad, telegraphic and express combinations of this period—we would at the present time probably call them "trusts"—which even then

were regarded with jealousy and apprehension, were really very powerful instruments in promoting the growth of American manufactures. Our natural advantages too were enormous, and these, with the stimulus afforded by the war contracts, were alone sufficient to set an infinite number of manufactories in motion.

One day, shortly after the war terminated, while visiting an iron master about 30 miles from Harrisburg, Pa., he took a party of us by rail from his residence to the top of a hill, which consisted, as he informed us, entirely of iron ore. At the summit his workmen were digging up this ore and shoveling it into cars, which descended by gravity and shot their contents into his foundry. The foundry itself stood over a coal mine, and thus the two principal elements needed for his manufacture were found almost on the same spot. All that he needed in order to coin these advantages into money was a market for his product, and this the Government had provided for him during the war. The result was a fortune so ample that he was enabled to become the owner of one of the largest and most fashionable hotels in New York, to say nothing of numerous other properties, most of them in Pennsylvania.

EXAGGERATED INFLUENCE OF THE TARIFF.

The antebellum tariffs on Hardware imposed but few specific duties. The rates were chiefly, almost entirely, ad valorem. The consequence was that the import entries usually only mentioned the value of the article imported and rarely the quantity. The war tariffs, on the contrary, levied specific rates—so much per pound or dozen—and the import entries were therefore required to specify the quantities, because it was upon the quantities or quantities and value, and not alone upon the value, that the rates of duty were levied. Owing to these circumstances there are but comparatively few articles of imported Hardware whose quantities can be traced from 1855 to 1862.

A SINGULAR RESULT.

After that date the number of such articles greatly increased. Upon a careful examination which was made in 1870 of the custom house returns, those returns upon which the duties were levied and paid, and which therefore afforded the most certain evidence, this singular result appeared: that after the first effect of an increased duty—that is to say, after the increased rate, and consequently enhanced price of the taxed article, had had time to diffuse itself by enhancing the prices of other things, including wages—the quantities imported became as great as ever and even greater.

For example, taking the article of "Stone" Iron Wire (finer than No. 16), which to us importers was of considerable importance, we found that in 1861 the imports under a 24 per cent. rate were about 250,000 pounds. In 1862, under a heavy compound rate, they fell to 225,000 pounds. Yet in 1863, although the rate was again raised, they rose to 1,750,000 pounds.

In 1864 they fell to little over a million pounds, and in 1865, under the influence of a further raise of duty, they fell to about half a million pounds. But here is where the diffusion took place, and although the rate was not abated the imports rose in 1866 to 1,371,000, in 1867 to 1,458,000, in 1868 to 2,667,000 and in 1869 to 3,475,000 pounds. For the year ended June 30, 1905, the importation of this article was 8,625,295 pounds, valued at \$639,303.

THE McKINLEY TARIFF.

Somebody must have communicated the important researches of 1870 to Mr. McKinley, for in his celebrated tariff bill he raised the duty upon "Stone" Wire, as well as upon everything else in the imported Hardware line, so high as to drive us entirely out of business. We had successively lost the trade in Nails, Tacks, Bundle Wire, Cables, Chains, Anvils, Sledges, Tools, Table Cutlery and so on down the list until every source of profit had disappeared except Sporting Guns, Pocket Cutlery, Razors, Tea Trays and a few other items.

From the date of the McKinley tariff they all slipped away from us and our once profitable houses were thrown out of business and had to close their American establishments and remove to other lands. The reason

was the exorbitant and vexatious requirements of this tariff. Yet, as is proved by the present year's figures, even this tariff has since been defeated by the rise of prices and diffusion of the tax. As shown by the researches of 1870, it was only a question of time.

INFLUENCE OF AMERICAN INVENTION.

The growth of American Hardware manufactures, and corresponding abandonment of foreign manufactures, was promoted by other causes as well as those already mentioned. America is filled by ingenious and inventive mechanics, quick to devise improved tools, implements and machines better fitted for the peculiar work to be done in this country than the foreign article. Our Axes, Hatchets, Hammers, Spades, Hoes, Hand Saws, Planes, Shears and numerous other tools and implements, are vastly superior to their British prototypes. Let any one try to fell an American pine tree, or worse yet, a hemlock or black walnut, with a British Axe, or nail a floor down with a British Hammer, or rip a board with a British Saw, and he will very soon observe the difference between the efficiency of these tools and their American similitudes.

THIS SUPERIORITY OF AMERICAN MANUFACTURES

extended to every line of Hardware and House Furnishing Goods. We used to import Sheffield Skates, made of wood, with steel runners curled up in front and fastened to the foot by a couple of Leather Straps. The moment the American Club Skate was invented the Sheffield articles ceased to be salable. Nobody would have them at any price.

It was the same with Table Knives and Forks. The first innovation was with the Fork. This implement, as made in Sheffield, had two, three or four prongs of steel, with a handle to match the Knife. The best class of Table Cutlery had Forks with three or four prongs, usually three; the cheaper classes had Forks with two prongs. The moment the Plated Fork was invented—and it was invented in America—it utterly destroyed the value of all those sets of Ivory Handled Table Knives which had been put up with Steel Forks; and as for a long while the British cutlers would not put up even Ivory Handled Knives without Steel Forks, they lost the entire trade.

THIS TRADE FELL INTO THE HANDS

of Lamson, Goodnow & Co., the Meriden Cutlery Company and other American cutlers, who were now—this was before the war and before the Morrill tariff—growing into prominence. The Americans also invented an improved bolster. The favorite Sheffield bolster, called the "Waterloo," had three grooves in it, all of which had to be subjected to the edge of the knife board before the Knife could be cleansed and brightened; while the American invention, called the "Yankee" bolster, had but one groove. The result was the rejection of the former and adoption of the latter, even when other considerations were in favor of the Sheffield article.

The length of the handle was another improvement. The British cutler, in order to economize cost and cut prices, had gradually abbreviated the length of the ivory handles, until they became too short for convenience. The Americans lengthened them again and secured the trade.

The pinning of the handle was another detail in which the American cutlers excelled. Finally, to crown all, and relieve the housekeeper from the difficulty of having the Knives polished, and from the splitting and loss of the handles by their immersion in hot water, the Plated Steel Knife was invented. This was during the war, when numerous manufactories were established and domestic servants began to be scarce. From that moment the Sheffield Table Cutlery trade in America, except for very low class goods, which for a while longer continued to supply a moribund market, was dead.

DECLINE OF THE FOREIGN IMPORTING TRADE.

Butcher Knives followed the same downward path. There was a time when nothing but a Wade & Butcher would sell. These Knives had good steel blades, strong,

serviceable handles and secure pinning, but they were always heavy, clumsy and unwieldy. The American cutlery first tried the market with imitations of these goods but without much success. They put up a better and neater article, but the name of Wade & Butcher was too much for them. Then they tried another plan. They took the French Butcher (Sabatier) Knives for patterns, and lo! the superiority of these Knives was so obvious that they secured a market at once. This market has since grown, so that now the old English patterns have become almost obsolete. We do not make so flexible a Knife as the French, but the shape is the same and the implement is rather more serviceable.

AS FOR SAWS.

the market for which for several decades had virtually been in the hands of Spear & Jackson of Sheffield, the whole of this large and lucrative trade fell almost at once to Disston of Philadelphia. The carpenter when he had to rip a board used to stick a wooden wedge into the seam to keep it open wide enough for the Saw to move freely. Disston simply made the back of the blade thinner than the cutting edge, the thickness of the blade gradually diminishing from front to back, and so the carpenter's wooden wedge was dispensed with. It was like the Gimlet Pointed Screw. Formerly the carpenter had to bore a hole with a Gimlet for each Screw he employed. The Gimlet Pointed Screw, which as before stated was a Yankee invention, was itself the Gimlet. It was no sooner put upon the market than the British Wood Screw trade in America came to an end.

GUNS AND PISTOLS.

London and Birmingham always maintained, and to a certain extent they still maintain, their hold on the American market for Sporting Guns. The most noted gunsmith in London was Wesley Richards; the most noted in Birmingham, among several notable houses, was probably Greener. A double Gun by Richards was sometimes worth as much as \$500 and by Greener from \$200 to \$300. Naturally it did not require a very extensive order for either of this class of tools to foot up a heavy invoice. The Southern planters were the principal purchasers of these expensive Firearms, and the Southern Hardware dealers were our best patrons. But in Pistols the British manufacturer

HAD TO GIVE PLACE

to his American rival. The Revolving Pistol is an old invention, originally Moorish or Arabian, some examples of their fabrication being still to be seen in the Vienna collection. During the sixteenth century several forms of Revolving Pistols were devised, chiefly of the "black-box" type, but some also of the cylindrical form. The example now in Warwick Castle is of British make and antedates Colt's famous Arm. But it was Colt who perfected the weapon and made it not only superior to Manton's fatal Double Barrel but very much cheaper.

COLT'S FIRST PATENT

was taken out in 1835, but it was not until the Government demand for it took place, which was occasioned by the Mexican War, that he was able to make the Revolver by machinery, and thus not only to make every Pistol and all its parts exactly alike but also to make them at a popular price. His first Government order was in 1847. His great factory at Hartford was erected during the fifties, and it was not long in operation before the Manton and Wesley Richards Dueling and Double Barreled Pistols began to disappear. The Revolver had come to supersede both of them.

Like many other items of London, Birmingham, Wolverhampton and Sheffield manufacture, the remaining stocks of them were worked off upon remote countries and they were made for the trade no longer. When the American Hardware drummer goes to Brazil and ventures into the remote provinces of Minas, Geraes and Goyaz he will still find on the shelves of the country Hardware dealers some of these ancient derelicts, destined never again to make their appearance in more progressive countries.

HOLLOW WARE.

British Hollow Ware, both enameled and tin lined, was a considerable item of importation into the United States and this continued down to 1862, when the government bought up everything that would serve for a camp kettle, including even the fish kettles and soup digestors; and the American Hollow Ware, first of Philadelphia make and afterward of other cities, became successfully established. The earliest New York Hollow Ware was made, I believe, by Abendroth.

BUILDERS' AND FURNITURE HARDWARE.

It was in Builders' and Furniture Hardware that the American manufacturer first exhibited his striking superiority. Here was room not only for ingenuity but also for taste, and in both these respects he easily and quickly distanced his foreign rivals, so that with or without any advantages that legislation could confer he filled a place that never can be wrested from him.

Moreover, he was now not restricted to iron and steel. Builders' and Furniture Hardware is largely made of bronze, brass and other alloys susceptible of being cast or wrought into very tasteful forms. Door Locks and Knobs, Bronze Hinges and Fittings, Brass Furniture Handles, Fancy Headed Screws and a great variety of small articles in common use and demand appeared from down east manufactories, articles which in point of a solidity, beauty and good workmanship made both British and German goods look very common and clumsy.

CHARACTER IN HARDWARE.

There is almost as much national character about Hardware as there is about the human countenance. An experienced traveler can tell at a glance the nationality of an Englishman, Irishman, Frenchman, German, &c. In the same way an old Hardware merchant can tell the nationality of a knife blade, a nail, a screw—indeed, of almost any article in the line of his trade—no matter what the stamp or mark on it may be.

WHEN REMSCHIED AND SOLINGEN

first began to pour their cheap Cutlery into this country they often stamped it "Rodgers," that celebrated cutler being dead, and a number of British imitators having made common use of his name and so thrown it to everybody else. But the German stamps misled nobody in the trade. The Teutonic nationality of their wares was so obvious that only the most verdant buyer could possibly take them for anything but what they were. Their chief merit was cheapness, and while this is a quality or characteristic that has much to do with the salability of goods in most parts of the world, it has not the same force in America as elsewhere.

WHAT THE AMERICAN BUYER WANTS.

first of all, is a good thing—the best of its kind. Of course he wants it as cheaply as possible. But the main point with him is quality. That accounts for the popularity of Wostenholm's Cutlery. It was always well made and it is well made yet, so that in spite of high tariffs and other discouragements it continues to command a market in this country.

For this reason German Cutlery in the fifties had no large sale in America. In the sixties it began to pick up, not so much because of its cheapness, but mainly because it began to be better made. However, the Sheffield cutlery still held the palm and their best goods continued to hold the market. On the other hand the common run of Sheffield Cutlery and Tools retreated with the rise of American invention. In like manner Sheffield plate went to the bow-wows just as soon as the electro process was established.

HARDWARE NOVELTIES.

Another class of Hardware and house furnishing goods arose during the fifties and sixties which was peculiarly American. This included such articles as Rotary Meat Cutters, Sausage Stuffers, Apple Parers, Cherry and Raisin Seeders and numerous other similar devices for economizing household labor. The upright Refrigerator, with ice chamber above and food chamber with

shelves below, was also an American device and even yet is but little known in foreign countries.

The Carpet Sweeper, Nail Puller, Rotary Ice Cream Freezer, Spring Hinge, Pneumatic Door Buffer and many other devices now in common use on both sides of the Atlantic are of American origin; and although some of these devices, as the Carpet Sweeper and Door Buffer, are popularized abroad, the other ones are not.

AGRICULTURAL IMPLEMENTS.

As for Agricultural Implements, the foreign manufacturers are a long way behind us. A few years ago there was a Yankee taking orders at the agricultural fair under the walls of the Kremlin, at Moscow, for a common Flax Hackler, a device long used in this country, but apparently quite new in Russia. The Harvester, though known in Europe, is but comparatively little used.

The general complaint in foreign countries about American Agricultural Implements is that they are either too slender or too complicated for use by the rough and ignorant peasant, who either ruins them by violence or clumsiness or else misuses them for lack of mechanical knowledge. Of course there is no help for this except to make the Implements heavier or simpler; but then they would no longer be American. They would so nearly resemble their British analogues as to be undistinguishable from them and they would fail of their chief merit, which is precisely this very lightness and mechanical perfection.

SADDLERY HARDWARE, PLATFORM AND SPRING SCALES.

In Saddlery Hardware we have made but little advance upon the British manufacturers—at all events an advance not so marked as is sufficient to command a market for this class of goods in England. In Farm Wagons and in Carriages and other vehicles we can beat them easily, but these things are not properly within the line of Hardware and so must be omitted from the present review.

Platform Scales, Spring Scales and Compound Scales for special uses are all in our favor. We can and do beat the world in them for precision, elegance and cheapness; but custom is here against us, and not only custom but the law. For many purposes, as for example the weighing of bread, the law in many countries insists upon the use of balances with stamped weights, and no matter how much more convenient the platform or spring scale may be it cannot be used. Bread is not weighed in America. We have no "assizes" of bread, no requirement that the loaf shall weigh so and so much, but in England and several other countries bread is weighed and in some of them the price is fixed by law.

The object of this statutory provision is to protect the poor against the extortion of bakers, but as in many other cases the law is evaded; in this instance, by mingling potatoes with flour, with the result that the buyer gets an inferior and indigestible loaf in place of a good one. He gets the quantity, but loses in the quality.

PLUMBERS' HARDWARE.

Plumbers' Hardware of American make has made but little progress abroad. The British manufactures are still regarded as good enough for Englishmen, and as for other countries the metrical system drives us out of market. The system of open plumbing work is as yet unknown outside of America, and most of the ingenious devices and patterns familiar to plumbers on this side of the ocean have yet to be introduced abroad.

As for South America, it would horrify the reader were the plumbing, or rather the absence of it, fully described. In some of the Spanish-American States aqueduct water in the house is not yet introduced. There is a common fountain, from which the water has to be fetched in kegs, pails or jars. The rest of the plumbing arrangements are indescribable. The result is periodical yellow fever.

It can be asserted with entire confidence that if ever the American plumber gets his work into these countries the yellow fever will disappear. Some of the doctors say it is the mosquito; but far worse and more dangerous than the mosquito is the filth which abounds in nearly

all Spanish and Portuguese-American households, due to the absence of running water and proper plumbing.

WOODEN WARES SOLD BY HARDWARE DEALERS.

In Wooden Wares, many classes of which are to be found only in Hardware shops, we are far ahead of all competitors. There is no country in the world which produces such a variety of cheap serviceable timber, suitable for manufacturing purposes, as the United States. There are no Plow, Hoe or Shovel Handles equal to the American. Our Axe Helves enjoy a reputation which stretches from propinquitous England to distant China.

Chopping Bowls, Knot Bowls, Ladders, Rolling Pins, Pastry Boards, Ironing Boards, Clothes Pins, Butter Prints and numerous other Wooden Wares sold by Hardware dealers when not American are for the most part practically unsalable. Nevertheless they make a very decent Butter Print in England and a good Meat Tray in France.

The Chinese and Japanese furnish Japanned Wooden Bread Bowls, Trays and Stands, but for the rest the American Wooden Ware manufacturer commands the market. Boys' Sleds and small Express Wagons, both of which are included in Wooden Wares and sold almost exclusively by Hardware dealers, are also regarded everywhere as the best and cheapest when stamped "Made in the United States of America."

A FIFTY-YEAR COMPARISON.

People as a rule do not care to read statistics, but upon an occasion like the present one, when a retrospect covering half a century of time is being made, it seems very desirable to possess the means of making an accurate comparison between certain details of the Hardware trade way back in the fifties and the present time. These details are taken from the official reports of both periods and may be relied upon for precision:

TABLE SHOWING THE IMPORTS OF HARDWARE INTO THE UNITED STATES DURING THE FISCAL YEARS 1855 AND 1905, RESPECTIVELY. [FROM THE COMMERCE AND NAVIGATION REPORTS.]

Hardware.	1855.	1905.
Muskets, Guns and Rifles.....	\$28,797	\$218,626
Firearms, not specified.....	659,650	557,032
Side arms.....	5,701	.....
Needles.....	211,604	406,011
Cutlery.....	1,822,191	1,800,704
Other manufactures of Iron and Steel, not specified.....	4,369,232	4,844,495
Cap or Bonnet Wire.....	5,936	.....
Nails, Spikes, Tacks, &c.....	109,670	.....
Chain Cables.....	633,674	41,944
Mill, Cross Cut and Pit Saws.....	28,761	.....
Anchors and parts thereof.....	87,076	.....
Anvils and parts thereof.....	67,495	24,332
Copper Wire.....	854	.....
Braziers' Wire.....	3,947	.....
Copper Bottoms.....	4,536	.....
Manufactures of copper, not specified....	154,013	100,944
Copper Nails and Spikes.....	1,686	.....
Brass Wire.....	9,733	.....
Brass manufactures, not specified.....	228,918	80,731
Tin manufactures, not specified.....	32,250	.....
Lead Shot.....	5,995	.....
Lead Pipes.....	2,761	.....
Lead manufactures, not specified.....	974	7,919
Pewter manufactures, not specified.....	1,101	.....
Zinc in sheets.....	404,081	15,418
Zinc Nails.....	3,797	.....
Japanned Wares.....	37,542	.....
Britannia Wares.....	32,948	.....
Burr Stones.....	67,754	.....
Glue.....	13,209	701,847
Gunpowder (sporting).....	5,307	.....
Hardware and manufactures of metal, n.o.s., about.....	3,000,000	3,000,000
Articles specified in 1905, but not in 1855:		
Iron and Steel Wire.....	.....	639,303
Files.....	.....	87,292
Totals.....	\$12,061,193	\$12,526,598

From this table it will be observed that, in spite of half a dozen tariffs, each one higher than its predecessor, the foreign Hardware trade into America has not been diminished at all; indeed is a trifle larger at the present time than it was half a century ago. Not only this, but making allowance for altered classifications, nearly all of the important items of the antebellum trade continue undiminished.

Without repeating the figures, this fact is to be noticed

in Fire Arms (Shot Guns and Pistols), Cutlery, other manufactures of Iron and Steel, Anvils, manufactures of Copper, n.o.s., and manufactures of other metals. The articles which, for whatever reason, have either ceased to be imported, or have greatly dwindled in importance, are Iron or Steel Nails, Spikes and Tacks, Saws, Anchors, manufactures of Copper, manufactures of Brass, of Zinc, Britannia and Pewter, and Japanned Wares, chiefly Tea Trays. On the other hand, the articles whose importation has grown in importance are Needles and Glue; the former having now but little connection with the Hardware trade, and the latter but little more.

But while the trade in foreign Hardware has thus substantially stood still the country has not. In 1855 the population of the United States was 27,256,000. It is now over 83,000,000; more than three times as great. Had the proportion of foreign made Hardware merely kept pace with our population it would now amount to something like \$40,000,000 a year, instead of \$12,000,000. The difference must be ascribed to one of the several influences above mentioned.

SURPRISING GROWTH OF HOME MANUFACTURES.

Turning from the progress of the American Hardware trade, as reflected by the decline in the consumption of foreign manufactures, to its progress, as shown in the growth of domestic manufactures, the data exhibit the most surprising results. Our source of information is found in the 16 quartos of the gloomy and disordered compendium called the United States Census of 1900; although some of the data adduced are extended to the present year. The limitations of space will not permit a comprehensive view of this growth; we can only glance at two or three of the principal items of the Hardware trade.

AGRICULTURAL IMPLEMENTS.—To the country dealer this is the most important item of his stock, and even to the city dealer, if we include in it Spades, Shovels, Hoes, Rakes, Garden Implements, Barrows, &c., it is not an unimportant item. Even with the intimations already given with regard to the growth of home manufactures, it can scarcely fail to excite astonishment that the capital invested in the manufacture of Agricultural Implements is nearly 50 times greater now than it was half a century ago.

The number of establishments manufacturing this class of Hardware in 1850 was 1333, while in 1900 it was only 715. The capital invested in them in 1850 was \$3,500,000; in 1900 it was \$157,750,000, a striking proof both of growth and concentration, but not of such concentration as constitutes monopoly, for there are still 715 rival establishments in active operation. The number of employees in 1850 was about 8000; in 1900 nearly 48,000. The annual wages paid in 1850 amounted to about \$2,500,000, an average of \$312 a year; in 1900 to \$22,500,000, an average of \$470 a year; the annual value of the product in 1850 was \$8,750,000; in 1900 it was \$101,250,000.

These figures are most eloquent. They show that while the population has grown three times, the consumption of agricultural implements, even after the exports of these implements are deducted, has grown more than 12 times. We now employ six times as many people in making these implements and pay them half again as much wages per annum. When it is remembered how largely steam power and machinery are now employed, compared with half a century ago, the last named showing is very significant. Workmen, with a prejudice that machinery displaced labor, have often shown a disposition to smash machinery, and even yet are hardly reconciled to the concentration of capital.

Now here is a very plain case where the number of establishments has been diminished to nearly one-half, yet which employ six times as many laborers and pay them 50 per cent. higher wages. Why? Because by this concentration of energy and adoption of machinery the manufacturers can make better and cheaper goods, still make a profit on them and fill a market 14 times as great.

NAILS.—Owing to the cheapening of Steel and the preference for Wire Nails over Cut Nails, this industry has undergone so remarkable a change that a mere formal

presentation of results would fail to show the progress which has been made during the period under review. In 1855-60 we annually produced about 2,000,000 kegs of Cut Nails of 100 pounds each, but no Wire Nails. At first these were imported, though in no great quantities.

It was not until 1883 or 1884 that Wire Nails came prominently into the market as a competitor of Cut Nails. Steel Cut Nails were not made until about 1883. In 1886 we had 27 establishments manufacturing Wire Nails, producing about 600,000 kegs a year; in 1890 we produced 2,893,000 kegs; in 1900, 7,390,000 kegs; in 1901 we produced from 61 establishments 9,804,000 kegs.

Meanwhile the production of Cut Nails steadily declined. From 2,000,000 kegs a year half a century ago this manufacture fell to 1,700,000 kegs in 1900 and at the present time hardly exceeds 1,500,000 kegs, as against about eight times as many kegs of Wire Nails which we now turn out.

WIRE.—The census returns make it appear that the manufacture of Wire decreased from 1890 to 1900, whereas, as is well known, it steadily increased during that period. The quantity of Wire manufactured in 1855 is not shown in the census, but it was in fact quite small. But two manufacturers of that period can be recalled, both of them by the name of Washburn. Their combined annual product did not probably exceed in value two or three millions a year. They had an agency at 282 Pearl street—a firm called Woodhouse & Co., the active partner and drummer being a Canadian named Macdonald, who after the failure of the firm disappeared in the insurance business. The firm went to the bad shortly after the opening of the Civil War, about the time when American Wire received through legislation a grateful stimulus.

From this small beginning the Wire manufacture steadily grew until in 1890 the annual product was over \$22,000,000; in 1900 it was \$44,750,000, and at the present time it is about \$50,000,000; but it should be stated that a considerable portion of the Wire reported by Iron and Steel establishments is not sold as such, but is manufactured by the same establishments into Wire Nails.

RECAPITULATION.

These observations might be extended to embrace every item in the Hardware list, all of them showing an immense growth, a growth so steady and so thoroughly based upon local advantages and requirements that whatever vicissitudes may await us in future from financial or other extraneous sources it may be relied upon that the American Hardware trade enjoys no ephemeral existence, does not depend upon tariff or any other kind of legislation, but is solidly based upon national advantages and the national character, and therefore can never be seriously affected by foreign competition, come from what quarter it may. To-day we are the largest producers of iron and steel, and of coal, petroleum and electrical energy. We are also the largest producers of manufactured Hardware, of almost every description, and possess a store of physical energy in our natural water powers and of intellectual energy in our educated and ingenious workmen that cannot fail to keep us where we clearly are now, in the van of Hardware producers.

WM. FRANKFURTH HARDWARE COMPANY'S NEW CATALOGUE.

WM. FRANKFURTH HARDWARE COMPANY, Milwaukee, Wis., has issued a new general catalogue of the goods regularly handled by it. It contains nearly 1900 pages, each 9¼ x 12¼ inches, bound in cloth, there being 12 different departments for the comprehensive lines of Hardware and related goods. Assortments have been increased in each branch, particularly in Sporting Goods, including Baseball and Football Goods, Fishing Tackle, Guns, Ammunition and Hunters' Outfits. It is the purpose of the company to carry in all lines the best manufacturers' brands whose goods command a standard reputation with Hardware merchants. The well-known lines include Mechanics' Tools, Builders' Hardware, Farm Implements, House Furnishing Goods, Metals, Store Furniture and other kinds of General Hardware familiar to Hardwaremen.

REMINISCENCES OF THE HALF CENTURY

PHILIP CORBIN'S REMINISCENCES.

WE give below the substance of a recent conversation with Philip Corbin, head of the American Hardware Corporation, New Britain, Conn., in which he entered in some detail into the story of his life, including the conditions under which more than 50 years ago he commenced the manufacture of Hardware. In the freedom of such an interchange of views Mr. Corbin referred to some events in his early life and to his gradually widening experience, in which those who know him well will find illustrations of the decision, energy and judgment which have been characteristic of him in the later years and which have contributed so much to his success. While Mr. Corbin shrinks from publicity in personal matters a multitude of friends in the trade will welcome the insight thus given into his character and career and many a young man find teaching and encouragement in the example thus presented. A graphic idea, too, is thus given of the conditions existing half a century ago. The following remarks of Mr. Corbin will be read, we are confident, with much interest and pleasure by the trade.

A FARMER'S SON.

When I was 18 years old my father wanted to hire me out to a farmer named Elmer to lead a gang of men. He had a farm of 400 to 500 acres. In those days there were no mowing machines—everything done by hand. It is pretty hard to lead a gang of men when you mow with seven or eight men, with every one of them taking you by turn and trying to whip you and you trying to keep ahead. I told father I did not believe I could stand it, that I would break down before the season was over and that I wanted to go down to New Britain and work in the factories, or that I would go to sea, for I had studied navigation and had become familiar with it. I thought that if I should go to sea and behave myself and continue my studies I could very soon improve my condition. My father then somewhat reluctantly consented to my carrying out my plan.

A WORKMAN IN NEW BRITAIN.

Accordingly, on March 18, 1844, I began work in the shops of Matteson, Russell & Co. (afterwards Russell & Erwin), for a contractor by the name of Charles Burt, receiving \$14 per month and boarded myself. I saved money. Board in those days was \$8 per month—cheaper than it is now. I worked overtime so as to get all the money I could for my father as it was due him. I went home in the summer and did the haying and did it in half the usual time.

When I got through haying for father I went out to work for the rest of the season. I did this so as to get all the money for the old gentleman he was entitled to. I worked from the first of August until the middle of September at \$1.50 per day, breakfast and supper at home and dinner outside wherever I happened to be at work and gave the money to father. As a matter of fact before the season was over I gave him more money than he would have got hiring me out at \$15 per month. I came back to New Britain and worked for \$22 per month for the next three months. Out of that I gave him \$12 per month.

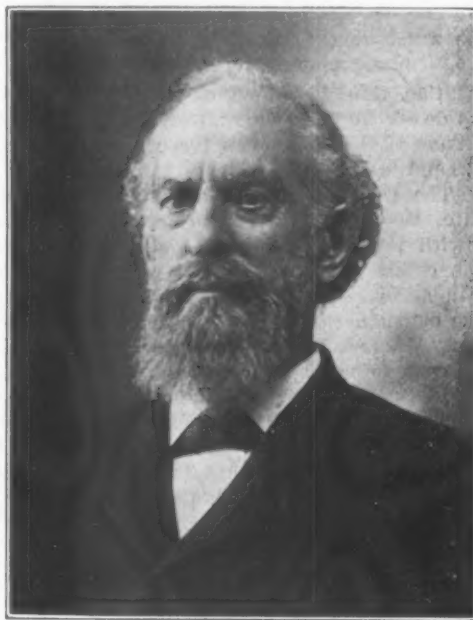
AIM HIGH.

My mother had an old uncle who lived in Ashford, Conn. He was quite a philosopher in his way and I went out and spent one fall with him. One remark he made I never shall forget: "Philip, when you get to be a man, aim high. If you aim on a level the shot will never go any higher, but if you aim high, though you do not hit the moon, you will get a good deal higher than if you aim level."

For the first five or eight years of my business career

it was very difficult to tell whether I was one side of the fence or the other, from the fact that I had no encouragement to go into business. My own relations and friends said that I was not qualified to do business—I had no business experience, no business knowledge, no backing, no money, and consequently I was unfitted to take hold of and run a business. I doubt if ever a young man went into a business of any kind with more adverse conditions staring him in the face.

If it had not been for close economy on my part and on the part of my wife (she was a very sensible and economical woman) we should never have made a success of it. She is entitled to her full share absolutely. Take it for the first 20 months of our business life. I did not draw one dollar out of the business and she worked in the factory (packing all the goods we made) and for 20 months we lived on \$18. You can imagine



PHILIP CORBIN.

very readily that we did not see much fun or anything that took money, but nevertheless we had a good time.

THE OLD SUIT OF CLOTHES.

Well, there is one thing I have always done, and I believe it is the right thing to do, and I try to impress it upon those around me, and that is to go to church regularly no matter where they are. If they are able to attend to business they are able to go to church. But there was one time when I did not go. In the early days when I got through with my contract I went home for Thanksgiving. It was October 26, and Thanksgiving came just a month later. I took home the money I had received from the contract and paid father up to the last day I was a minor. He looked at me when I had paid him as if he thought I had some money left. He needed it, as he had a family of 13 children and was poor. He said he wanted to borrow the money. I knew what that meant—I would never get it back. Mother finally came up to me—I was always influenced by her—and she said: "You know father needs the money." I hesitated, and finally said: "You know it means I shall never get it back," but she said, "Father wants it so badly." I said, "If I let him have the money I cannot go to church next Sunday."

Finally I turned my pockets wrong side out and gave him \$75 with which I was going to make myself a present of a suit of clothes and an overcoat. I went back to work on the contract and worked for nearly three months before I went for the overcoat and suit of clothes. They were all made, but I would not go after them until I had

the money. Meantime I wore my old overcoat and buttoned it up and kept it buttoned up tight, as my clothes were too ragged to be seen. That was when I was 21 years old.

TAKING UP BRASS MOLDING.

When I first went into business it was very hard to get brass molders. I had never worked at molder's work. I was a lock maker and a tool maker, but without any experience whatever I took up brass molding right away, and in less than a week's time I could do just as good brass molding as any man we could hire. Not only that, but we had a place for three furnaces and we had two benches and could not get any workmen. I took one bench with two to help me, and ran those three furnaces. I worked as long as I could see at night and earned \$7 per day. I earned it absolutely at the same price that other people made for doing work of that kind and that was my stock in trade.

When I started to make a business of my own I was asked (I remember it as plainly as yesterday): "Are you not doing well enough as you are?" I was earning about \$1000 a year, but my ambition was to do better. "Do you think you can make money in business when everybody else is failing?" As a matter of fact, nearly every one had failed in New Britain up to that time.

BORROWING MONEY.

About that time I wanted to borrow \$10, but was unable to do so. A little while after I wanted \$200, and did not know a friend in town I could go to. My own relations and my wife's relations would not let me have it. There was an old gentleman that I had known all my life. As a boy I used to go up to his place to get oysters with the other boys. He kept what in those days was called a bar. They did not call it a hotel then, or a saloon. It occurred to me that I would go up to the old man—a Mr. Lee—and so I went one day and said: "Mr. Lee, I want to borrow \$200." He asked me why I came to him. I said I did not know anybody else that would let me have it and I did not know as he would. "Why did you not go to Mr. Whiting?" (my wife's father) he asked. I said: "He would not let me have it, as he has no confidence that I will make a success of it." I never had bought any liquor of Lee, but had eaten oysters with the boys occasionally. He said, turning around to me: "Phillip, if I let you have this \$200 you agree to pay it back?" I said: "Mr. Lee, you will get it back as sure as you live." He went to a little old safe and counted out \$200. "Make a note for it?" I said. "I do not want a note," he replied. "When you get \$200 you can bring it back." He was the only man in town that would help me in any way. No one else would loan me any money or give me any credit. You will see I did not get much encouragement in my younger days.

AN INCIDENT.

When I was working in the Brass foundry I had been in the habit of getting my Copper in Hartford and ran up a bill for about \$1600. One day the merchant from whom I bought it came into the little shop we began business in and inquired for me. He said he wanted the Mr. Corbin who came to Hartford to buy metal. He was told I was at work in the Brass shop. He came out and looked me squarely in the face and said: "I want to see Mr. Corbin, the man who comes to Hartford—the one I sell metal to." I took off my paper cap—I was covered with dirt and smoke—but when he saw my head and hair he recognized me, and remarked: "I did not suppose I should find you here. I am a little short of money and I thought I would come out and see if you could not let me have some."

Well, that was a poser. I had no money. I told him that I had no money, for we never sold our goods for cash, but that I had some notes in the house and if he would wait until I got the heat off and closed the furnace I would go to the house with him. Meanwhile he stood by watching me pouring off, &c., never having seen the operation before, until I closed up the furnace and went to the house with him.

I took my little ledger, for I kept my own books, and they were posted up every night, and said that if he would take a piece of paper I would show what was due

us and what we owed. I thought it was about time to make a clean breast of it to the old gentleman. He took the paper and made credits on one side and debits on the other and asked: "Is this a correct condition of your affairs?" Let me say we had about \$3 due us to every \$1 against us, but no money. I had notes that I could let him have to cover the amount. He went to work picking out notes. "Now," said I, "take about \$500 more in notes, because I shall want more metal pretty soon." I told him to take off interest and give me credit.

As he buttoned up his coat he said: "You can have all the metal you need at any time. I will give you all the stock you want." I then said: "I want to ask you a question and I want you to answer it." He said he would answer it if it was a fair question. I said: "Who sent you here?" He looked at me a moment and said: "Who sent me here?" I said that he did not come because he wanted money, but that some enemy of mine who wanted to close me up sent him. He then admitted that he came at the suggestion of a prominent man in the town.

MANUFACTURERS' METHODS.

The use of machinery was at first very limited. I remember when the first planer was brought into New Britain. I know I used to make my Dies with Cold Chisel and File. No such thing as a planer in New Britain when I began business. Where it is a day's work now to do a certain thing it would be three or four days' work then, and it required a good deal more skill to make things then than it does to-day. Forging is infinitely easier to-day than it was then. Forging now is done very nicely indeed, everything just as you want it. A blacksmith in those days when I first began used to do horse shoeing, or ox shoeing and farmers' work and all that sort of thing, and when he had nothing else to do he would make machinery forgings for tool makers, in a very crude manner of course.

UP-TO-DATE MACHINERY.

Then as opportunity presented we bought new machinery and were making additions all the time. It was often desirable to dispose of machines that were doing fairly well to replace them with something better. I remember when one man had been at work for us making a machine that cost over \$1000, and when I went into the shop with him to see it start on the first piece of work I made the remark: "This is quite an improvement." "But," he said, "I have in mind a machine that will do the work for half what that will." I told him to go to work and make it. When he asked me what I would do with the machine before us I said: "We will throw it away when you get the other machine at work," which we did.

This principle we carried out right along. It does not pay in a manufacturing business to wear out a machine because you have it. If you can find a place where you can save by making new tools and better tools than you have you want to get those tools at once and get the benefit of the improvement. I do not care what a machine costs so long as it earns its money. We have all along been making improvements, and when they were done they have usually been just a little too small. The business has grown up to them. It has always been so. We always made preparations for more business the next year than we did the year previous.

The result has been that the American Hardware Corporation is the largest in our line in the country, comprising as it does P. & F. Corbin, the Russell & Erwin Mfg. Company, the Corbin Screw Corporation, the Corbin Cabinet Lock Company and the Corbin Motor Vehicle Corporation, and employs nearly 6000 hands.

RELATIONS WITH OUR EMPLOYEES.

We have always had very pleasant relations with our employees. In the early days I put in a great many hours' work. I once told a man who came here interested in unions that if I had belonged to the union there would be no P. & F. Corbin. The union would not have allowed me to work 18 hours a day.

In all our history we have had but little trouble with labor. We had a strike in 1885 and 1886. We employed

at that time about 1000 hands and about one half of them went out.

They worked in our foundry and in our polishing and grinding rooms. They wanted to make a union shop absolutely—what is called at the present time a closed shop—and when they made this last demand I made up my mind we would fight. Union men can work here and we are glad to have them, but they cannot run the business. Out of 400 or 500 that went out on the strike at that time less than 30 ever got back.

FACTORY MANAGEMENT.

For the first ten years I traveled a great deal. My last trip was in 1859. Yes, I traveled quite a good deal, but since that time I have had little to do with selling. I leave all that to others. My idea is and always has been that you can hire traveling men and salesmen of ability, but it is more difficult to find men qualified to run a factory. That is the main work and where the success in our line lies. The factory is the headquarters.

MARKETING GOODS IN BOSTON.

In the early days of my experience on the road I went into the store of the firm of Brooks Brothers, Boston (by the way, one of the brothers was the father of Phillips Brooks). I went there with my samples and inquired for Mr. Brooks, and they said he was upstairs. I went upstairs—steps like a ladder—carrying up my little sample box, about 18 inches square. Mr. Brooks was up on a ladder packing away cases of goods as the boys handed them to him. I stood unnoticed for quite a little while. He finally turned around and looked over his shoulder, did not come down, and asked me what I wanted. I said I had samples of goods to show him if he would come down. He stood there. I asked him if he did not want to come down and I would open my box and show him the samples. I had Barrel Bolts, &c. He had always imported his Hardware from England and Germany. He looked at me and said: "Were those things made in New Britain, Conn.? Did you manufacture them?" I said "Yes," and asked him to step down and look at them. "No, sir," he replied; "I don't want to buy any of your goods and I don't want you to come into this market. When I want you to come into this market and into this store I will send for you."

Some three years after that I was in Boston at M. C. Warren & Co.'s showing some of my samples—I then had a little trunk, as the business had grown away from my box. One of Mr. Brooks' clerks was in from their store, probably not over 100 feet away. He said: "Mr. Corbin, why don't you come into our store with your goods?" I said: "Three or four years ago Mr. Brooks said he would send for me when he wanted me and he has not done it yet." He went out and was gone about five minutes and then returned, saying Mr. Brooks would like to see my samples. I made an appointment with him, and when I went in the old gentleman said: "I treated you rather abruptly when you were here several years ago, didn't I?" I said: "I thought you did; you turned me out of doors." "But I didn't mean to do that," he said. "I have seen those goods of yours in the market and I suppose I shall have to buy some."

PANIC OF 1857.

When I first went into business we gave our customers a discount of 5 per cent. in 30 days—that is 5 per cent. per month. We were always glad to get cash, but we did not get it very often. When a concern discounted a bill for 5 per cent. it was something remarkable and everybody wanted to do business with him. When the Ohio Trust Company failed in 1857 for about half a million everybody failed and business was suspended for months. That was in August. We did not start a wheel during that winter. No business was done. I went as a last resort to the Old State Bank, in Hartford, and drew out \$300 in gold and took it home and put it aside and paid it out 25, 50, 75 cents and \$1 at a time to the men to get something to eat. There was a great deal of hardship among the people at that time.

That panic of 1857 was the worst panic since I have been in business, though I remember the panic of '37, when I was a small boy. No panic since has been so bad as that of '57. I had a note due Brown & Brothers in Waterbury for \$1000. Brown had taken our note and discounted it. I went to the Old State Bank, Hartford,

but they would not take anything but cash for it; would discount no paper for it—I had good paper. I went to the Phoenix Bank, but it would not help me out. I drove over to Waterbury (no railroad in those days) and on my way over I met Brown coming over to see us about it. At that time I thought he was doing me a great favor to let me have the money at 2 per cent. a month. I paid in cash rather than have the note go to protest. We were one of a few concerns in the country who did not go to protest in those days. Almost everybody let everything go to protest.

CAREFUL ATTENTION TO ORDERS.

We have always endeavored to take good care of our customers. I cannot give a better illustration than to tell what happened when I had been in business about three years. I have always intended to accommodate my customers, and this will show just how I did it. I received one day a small button—a little flat button about 1¼ inches long—from one of the leading houses in Boston. They wanted to know what our price would be for making them. It was simply a button with a screw hole in the center and you would turn it exactly like a thumbscrew. Well, I improved it and sent it back and got an order for a small quantity. I went to Boston soon after with my samples and called on the house for whom I had made the goods. As I went in a clerk said that Mr. Fisk, the head of the firm, wanted to see me. I went in and there he was—an old Englishman, dignified and pompous as you please. Very much to my surprise he gave me a good big order for those days for our Yankee notions.

After he got through he said: "Mr. Corbin, do you know why I gave you this order?" I said: "I suppose because you wanted the goods." He said: "A very good answer, but I gave you this order for another reason. Do you remember my sending you a little button?" I said I remembered that very well. "You made and improved upon it, and sent it back at a very reasonable price. You made me a very nice article. We bought our locks from ——— and I sent the button to them and they sent it back saying they could not make it. I sent it to ———, as we buy some of their goods, but they sent it back with such a high price that our customer would not buy it. One of the young men suggested sending it down to your concern. Never having dealt with you I hesitated, but finally did so. The result was an improved article and the price less than one-third what ——— charged. I concluded you were a nice sort of a man to deal with. I told the clerk I wanted to see you when you came in again."

It has always been my aim and object to deal fairly. Instead of making an extraordinarily high price, my idea was to make a price that would be fair and yet be profitable. I have never taken advantage of anybody and got more than I ought for an article, and in a similar spirit I have always instructed our traveling men not to make any statements in regard to goods unless they were absolutely true.

When there is any reason for complaint and I get hold of it they catch it! As a manufacturer I want to be accommodating and I judge others by myself. Nothing gives a good impression like trying to make your customers feel safe in your hands. That is the English of it.

OPPORTUNITIES FOR YOUNG MEN.

There were no opportunities for young men in that day which are in any way to be compared with the opportunities of the present day. Opportunities look around to-day for young men. Look at the immense amount of business. There are opportunities not only in manufacturing but as merchants and in professional life such as were never known before. If a man shows industry and ability and will take hold and see what he can do he will find plenty of opportunities. Business has got to go on, and the young men, of course, have got to do it—there were no such business opportunities to offer themselves in those days. As I said before 500 would cover all the hands employed in New Britain when I started out to make a business of my own, and, as I said before, I had no encouragement, no reason in the world why I should succeed, except my own industry and frugality.

ECONOMY ESSENTIAL TO SUCCESS.

Young men make a mistake because they do not keep a cash account. There is not a young man in our employ but could save money if he would. There is scarcely a man in the country, I do not care what he does, who could not save money if he would. As a matter of fact, since we were married (58 years next June) Mrs. Corbin and I have kept a cash account. Sometimes we look at it as a matter of amusement, but we never failed to put down everything we spent.

Another thing, I have always kept a diary for over 60 years every single day. Of course, I do not put down everything that comes up, but only important events, and years from now one could look and see that I had an interview with Mr. Williams on such and such a day.

The great trouble with our young men is that they do not save their money. You may call it being miserly or what you please, but young men are not going to make a success of life when they are extravagant with their money. I do not care what their business is or what their circumstances are, they can save money. That is the first important thing that they have to learn. I worked for \$14 per month and I saved money, but I did not spend any, except when I was absolutely obliged to. After we were married my wife earned about \$100 in the shop, kept two boarders and did the work, and I did not draw a dollar from the business. Yet we lived for a year and eight months on her earnings plus \$18. If one cannot succeed under conditions like that he is badly off.

THE SECRET OF SUCCESS IN BUSINESS.

Some manufacturers fail to make a success of their business because they do not get the proper facilities for making goods as cheaply as their neighbors, or they may have been extravagant in the management or private expenses, spending too much money as they go along. I have found that the secret of success is close economy, hard work, minding my own business, and in the selection of associates that are in thorough accord with the management. I have been very fortunate in this latter respect, for ever since I started in business I have had associated with me two or three of my brothers and others who were very loyal to the interests of the business, and for the last 40 years my brother Andrew has been the strongest element of the success of P. & F. Corbin, as he has practically given his life to the development of this enterprise. To my brother Andrew is due in a very large measure the success of P. & F. Corbin.

NEW BRITAIN HALF A CENTURY AGO.

By William H. Hart, President of the Stanley Works.

IN compliance with your request, having in mind the courteous treatment accorded to me by the managers of your excellent paper for many years past, although unusually busy at this season of the year, I will undertake to jot down some personal reminiscences for your anniversary issue. I will limit what I have to say mainly to the 20-year period between 1845 and 1865, leaving it with the reader to make the contrast between "then and now."

Recollections of my experience between the ages of 10 and 30 cover my schoolboy days (schooling and business combined, 1845 to 1854) and the first ten years of my business experience with the Stanley Works.

While attending school all of my spare hours were spent in assisting my father in his freight and forwarding business, which from its nature, necessarily brought me into close touch with all of the manufacturing industries of New Britain, and the shipments of the products of all the factories, and consequently the names of consignees became quite familiar to me.

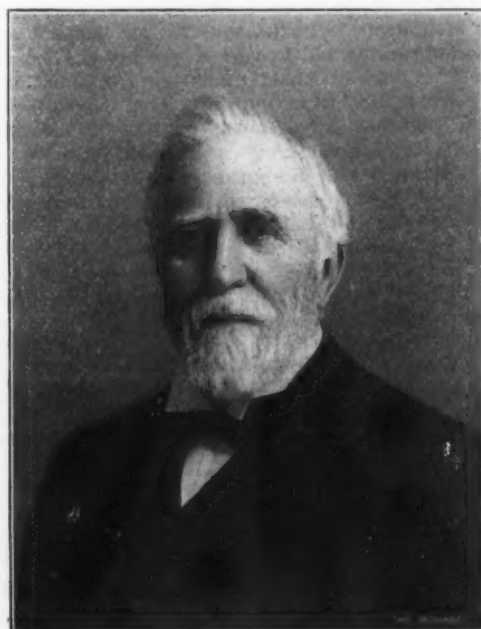
It has been my privilege to witness the wonderful progress that has been made in the line of manufacturing, methods of transportation, development of power plants, water, steam and electric, the invention of the telegraph and telephone systems, typewriting and computing machines and many other improvements in labor-saving methods, such as the practical use of stenography, letterpress copying, card and filing systems, &c.

THE POSSIBILITIES WITH PRESENT EQUIPMENT.

Looking backward over a period of 50 years as a manufacturer I am absolutely certain that a force of 1000 persons employed in almost any manufacturing business would with the facilities at hand in these days accomplish more in one day than could have been accomplished with the same force and the facilities at hand 50 years ago in one week.

GENESIS OF RAILROADING.

I have a very distinct recollection of the railroad track from Hartford to New Haven, built in 1839, and extended to connect with the Boston & Albany Railroad at Springfield in 1844, and the power and car equipment of same. The iron track was laid on stringers about 10 inches square, placed and held in position similar to present construction of the track across railroad bridges, and about the same distance apart as tracks of the present standard gauge. The tracks consisted of bars of wrought iron, tongued and grooved at the ends, about 4 inches wide and $\frac{3}{4}$ inch thick, which were spiked to the wooden stringers—a very poor construction as compared with the very lightest T-rails of to-day. The locomotives in use in those days were only about one-half the weight and power of those recently in use on the New York City elevated railroads. The passenger cars were not much larger than a large



WILLIAM H. HART.

sized stage coach, with capacity for about 16 passengers, entrance being on the sides, the conductor passing from one car to another on running boards similar to those now in use on open trolley cars. The largest freight cars had a capacity of about 8 tons, and there were many cars of half size and corresponding capacity. The weight of one of these cars was not over one-half the weight of one set of the six-wheel trucks used on large passenger cars today. Freight was transported between New York and the West largely by canal boats; also between New York and Philadelphia, and between New Haven, Conn., and Northampton, Mass. The railroad between New York and New Haven was built in 1848. Previous to its completion passenger and freight transportation between New York and New Haven was by steamers and sailing vessels. Whenever boat trains arrived late the conductors always had as an excuse "fog on the sound."

PRIMITIVE PASSENGER ACCOMMODATIONS.

Manufacturers and merchants whose business experience is comprised within the last quarter of a century have but a faint idea of the difficulties, troubles and trials of manufacturers or merchants 50 years ago. At a later date, about 40 years ago, accommodations for passenger transportation were very limited. Sleeping accommodations were crude and very unsatisfactory. Passengers were stowed away in bunks running lengthwise through the center of the car, with an aisle on each side, and they

were tucked away for the night in about the same manner that clerks store calico on the shelves of a dry goods store. No meals were served on cars, but the railroad companies advertised to stop 20 minutes at certain stations for meals. Notwithstanding this notice of time allowance passengers would frequently have barely time to pay for meals and begin eating before the conductor would shout "All aboard!" compelling passengers to snatch something from the table and run for the cars. I recall an instance when a party of men felt justified in gathering up in a tablecloth all the food and other articles on a table and finishing their meal on board the train; another case where a passenger was obliged to pay for an extra chair at the table occupied by his grip sack. Under the circumstances he proceeded to fill the grip with a week's supply of food.

METHODS OF PAYMENT.

It was the custom of many manufacturers 40 years ago, in selling goods between April 1 and October 1, to make settlements October 1 by accepting a six months note without interest, making similar settlements for the next six months period.

Western and Southern jobbers visited New York twice a year to meet manufacturers and importers and make their purchases for the spring and fall trade, the jobbers themselves being the purchasing agents.

Covering a period of upward of 50 years in the service of the Stanley Works, I have visited nearly all the cities in the United States, Canada and Mexico, and if time and space permitted I would be glad to put in print my recollections of the dealers in Hardware of my acquaintance. I cannot recall the date when Waters, Simmons & Co. started in business in St. Louis, but I do remember that 40 odd years ago it was a common remark that Ned Simmons "had bitten off more than he could chew." The magnitude of the business of the Simmons Hardware Company of to-day proves the soundness of Mr. Simmons' judgment and ability.

FIRST STEAM ENGINE IN NEW BRITAIN.

The first steam engine used in New Britain was installed in 1830 by Frederick T. Stanley, the founder of the Stanley Works, in his Wrought Lock factory, which was the first Lock factory in the United States operated by other than hand or foot power. Mr. Stanley in a newspaper article printed January 1, 1875, stated that he believed that this was the first factory in the State of Connecticut operated by steam power. F. T. Stanley commenced in 1843 the manufacture of Wrought and Cast Iron Bolts, Handles, &c., which was merged a few years later with that of the Stanley Works, manufacturer of Wrought Butts and Hinges.

The founders of the P. & F. Corbin Company, Philip Corbin and Edward Doen, and the founders of what is now Sargent & Co., of New Haven, Elnathan Peck and George Dewey (succeeded by the Peck & Walter Mfg. Company), started a manufacturing business in New Britain with power furnished by two horses at each factory. I well remember that the managers of the Peck & Walter Mfg. Company were the subjects of severe criticism by their neighbors when they first installed a steam engine in place of horse-power. The argument used was that their business was not large enough to warrant such an extravagant expenditure of money.

As I was intimately acquainted with and have pleasant recollections of nearly all the founders and proprietors of the several Lock factories of 50 to 60 years ago and as Locks and Hinges belong to the same Hardware family and in use are so intimately associated, it seems proper for me, a Butt and Hinge manufacturer, to make mention of the following: F. T. and Wm. B. Stanley, Truman and Norman Woodruff and Emanuel Russell, who were in partnership under the style of Stanley, Woodruff & Co. and whose interest Henry E. Russell and Cornelius B. Erwin purchased in 1840 and carried on under the name of Russell & Erwin until 1850, when they reorganized under the name of the Russell & Erwin Mfg. Company, merging with their business the Lock business of Seth J. North and Henry Stanley of the firm of North & Stanley; also the business of Wm. H. Smith & Co., manufacturers of Shovels and Tongs; Philip, Frank, William, Andrew, Waldo and George Corbin (brothers) of the firm of P. & F. Corbin, and it affords me great pleas-

ure to note that Philip Corbin, the principal founder of their large business and now president of the American Hardware Corporation, at the age of about four score years is still active in giving efficient oversight and direction to the extensive business under control of this corporation.

BEGINNING OF SARGENT & CO.

Joseph B. and George H. Sargent of Sargent & Co., successors to the Peck & Walter Mfg. Company, having a large money investment in the company, removed the manufacturing department to New Haven in the early sixties. It is a remarkable fact that Joseph B. Sargent, Geo. H. Sargent, Geo. Munson and Thomas J. Atkins have been associated in the Hardware business for about 50 years and the Sargent brothers over 50 years. I cannot recall an instance where the four prominent men of any concern have worked together so many years and at the same time always efficiently and harmoniously and I am happy to say that each appears to me about as active and attentive to business as a quarter of a century ago.

The Yale Lock Company of Stamford, Conn.; Bert Mallory of Davenport, Mallory & Co., New Haven; Thos. Kennedy of the Branford Lock Works, Branford, Conn.; Mr. Libby of the Norwalk Lock Works were also prominent in the Lock business. I recall other Lock factories in this section at Nashua, N. H., and at Norwich, Conn., but have little knowledge concerning them, except that they were unsuccessful and abandoned the business several years ago.

GENERAL ELECTRIC COMPANY'S BUSINESS STARTED IN STANLEY WORKS FACTORY.

It may be of interest to note that the electric business of the Thomson-Houston Company, now the General Electric Company, was started in the Stanley Works Hinge factory at New Britain about 30 years ago. The business developed to such an extent that it required a much larger capital than could be furnished by capitalists in that neighborhood, and for this reason the business was transferred to Lynn, Mass. I have clearly in mind one of the tests made by Professor Thomson in running a large circular saw by power furnished by one of his generators to a motor through about a mile of wire little larger than a cambric needle. The skeptics were offered an opportunity to stall the machinery by sawing heavy logs and attaching a brake to the line of shafting. It is needless to add that the test proved entirely satisfactory.

WROUGHT IRON BUTTS AND HINGES.

Wrought Iron Butts and Hinges were manufactured previous to 1870 by

Roy & Co., West Troy, N. Y.
Vallance & Co., Troy, N. Y.
W. & B. Douglas, Middletown, Conn.
E. W. Gilmore & Co., North Easton, Mass., O. Ames & Sons being part owners.
Miles Greenwood & Co., Cincinnati, Ohio.
The McKinney Mfg. Company, Hamilton, Ohio.
Strap Hinge Company, St. Louis, Mo., now C. Hager Hinge Company.
The Wheeling Hinge Company, Wheeling, W. Va.
Joseph Grass & Co., Pittsburgh, Pa.
Oliver Bros. & Phillips, Pittsburgh, Pa.
Lindsay & McCutcheon, Allegheny, Pa.
The Aetna Nut Company, Southington, Conn.
The Willcox, Treadway & Co., Cleveland, Ohio.
The Cooper Arms Company, Philadelphia, Pa.
Crooke Bros., New York City.
Arms & Wilson, Northampton, Mass.
The Baltimore Hinge Company, Baltimore, Md.
The Maryland Hinge Company, Fredericktown, Md.

Out of this list of 19 manufacturers 14 have found the business unprofitable and have consigned most of their machinery to the scrap heap.

EVOLUTION OF STEEL.

Previous to about 1875 steel was not manufactured of a quality sufficiently ductile for practical use in the manufacture of Hardware. I recall giving an order to Jacob Reese of Pittsburgh about 25 years ago for soft steel as an experiment to determine whether steel could be made ductile enough for forming a hinge joint without fracture, and that after making several trials he finally succeeded. Miller, Metcalf & Parkin were also successful about the same time in producing steel soft enough for this purpose, but it was of too high a grade to warrant its general use. The introduction of soft

steel has revolutionized the whole business in the manufacture of Hardware and has enabled manufacturers to produce a large variety of articles superior to and taking the place of cast brass and cast iron goods. It has also proved for such purposes to be far superior to Norway and Swedish iron.

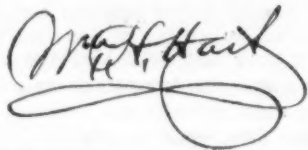
WHEN BRIGHT FINISHED HINGES ORIGINATED HERE.

Thirty to forty years ago large quantities of small size bright Iron Hinges were imported from Germany, the surface of such Hinges being finished by hand filing. As it was found impossible to duplicate such goods in this country at a profit the Stanley Works began a series of experiments by polishing the metal previous to making it into Hinges, by the usual method of emery wheel polishing. This finally led to the plan of taking the choicest grade of Swedish iron and passing it between heavy rolls, which operation gave the metal a smooth bright finish, enabling the company to put upon the market a better Hinge and at a price that completely stopped the importation of the foreign article. The Stanley Works was the first to manufacture cold rolled strip iron and steel in such a manner and to such an extent as to make it a commercial success, the manufacture dating back to the year 1870, but its master mechanic had cold rolled a small quantity as an experiment several years previous. To-day there are few Wrought Butts manufactured that are not made from cold rolled steel, and this material is used to a large extent in the manufacture of the finer grades of Hardware and kindred goods.

A TRIBUTE TO FORMER ASSOCIATES.

It was my good fortune to be associated in business for a long period of years—up to the time of their deaths—with F. T. Stanley, the president of the Stanley Works during its first 32 years, and Peter McCartee, manager of the company's New York store for over 40 years. Both these men were the finest type of Christian gentlemen, noble, generous, kind hearted and of the highest integrity, and I cannot refrain from paying them the highest possible tribute.

In writing the above I have not attempted to write a connected article, but have merely jotted down certain items as they occur to me as I look back over my early years in manufacturing.



NEW YORK IN THE FIFTIES.

By George H. Sargent.

IF one were asked to mention the most noted change among the Hardware merchants of New York City during the past fifty years he would refer to the almost entire elimination of those Hardware dealers who half a century ago were engaged in the Southern trade here and known as "Southern Hardware jobbers," of whom there were fully a dozen large and flourishing houses, and all at that time in the actual enjoyment of a very pleasant and satisfactory business.

BUT A FEW ENDURED

the calamity of the Civil War because of the entire suspension of their trade, and to many of them came the affliction of financial failure and compromise. Only two or three of this class of business houses are now in existence here, and these unimportant as successors to those prominent and long established concerns. The cross road buyers of the South have now no occasion to seek their wants beyond the cities in their various vicinities. These before the war merchants were generally esteemed for their fair and honorable characteristics, mercantile uprightness, their amiable and admirable attributes.

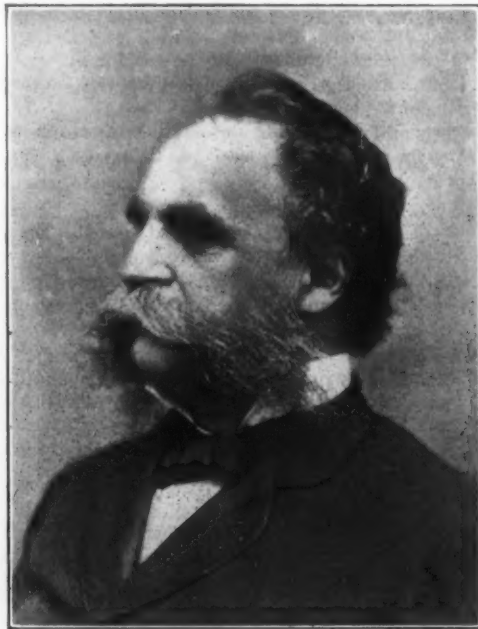
AWAY BACK IN THE "FIFTIES"

the Western jobbers flourished in this city, but the change in the manner of distributing goods by manufacturers and the long distance and heavy freight rates were against them. Added to these impediments was the fact of the

competition with our New York jobbers by the same class of dealers in the larger cities of this State, and especially by the Western cities in their increasing facilities for immediate delivery and minimum freight rates, hence these soon left no profitable clientele beyond the Hudson River.

THE CHANGES OF LOCATION

in this city of the Hardware dealers are not unlike those of the dry goods and other trades. Up to 1853 the Hardware houses were mostly in Platt, John, Pearl and Cliff streets. In 1854 Russell & Erwin Mfg. Company, Sargent & Co. and Clark, Wilson & Co. moved from Cliff street to Beekman, between Gold and Cliff, Bliven & Mead from Platt to Pearl, and later to Chambers, as Hart, Bliven & Mead. Walsh, Coulter & Wilson left Pearl



GEORGE H. SARGENT.

for Chambers street, and other companies deserted their places which had known them so well in these various streets, coming up to Chambers, Warren and Murray streets, and so along.

Russell & Erwin moved from Beekman to Chambers street in 1868, and Sargent & Co., after 21 years in Beekman, went to Chambers street in 1875. P. & F. Corbin went to 87 Chambers street about the same time. The English and German agencies scampered out of Beekman street, which then became quite completely abandoned as a Hardware home.

AS TO THE TREMENDOUS INCREASE

in the production of Shelf Hardware in this country since *The Iron Age* was born, the story is too long, and need not be repeated after all that has been so ably and copiously described in this same *Iron Age* as the 50 years have gone by. This increase, this growth, is indeed marvelous, and yet only consistent perhaps with the growth of our own dear country. Those persons unfamiliar with the obstructions interposed by the importers of Shelf Hardware 50 to 60 years ago can realize how the manufacturers of those days labored and struggled to overcome opposition and discouragement, but they "*got there*," as the street slangs it, at last, and whether by the aid of a low tariff or high tariff, "free raw materials," wise or otherwise legislation, it matters not to-day. We've got the "*get*."

Comparatively little shelf Hardware was produced in this country when *The Iron Age* was born, but now the reverse is true, and this assertion can have no illustration more marked and convincing than the fact that the original shop of a prominent Hardware manufacturing company established in the early fifties in New Britain was but as "a wart on Mount Olympus" compared with the extensive works of that same company in New Haven, its present location.

A HALF CENTURY IN HARDWARE.

By E. C. Simmons, St. Louis, Mo.

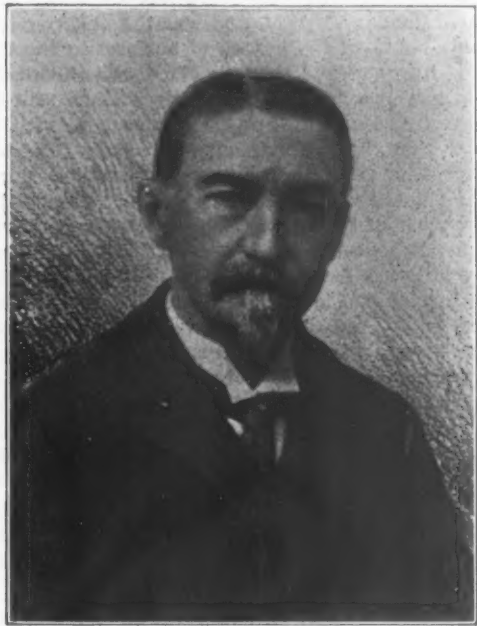
ACCEPTING your kind invitation to write for the fiftieth anniversary of your invaluable journal I do so with the greater pleasure because it is coincident with my semicentennial as a Hardware merchant and also from the fact that you so kindly suggested that I "make the personal note dominant."

ENTRANCE INTO THE HARDWARE BUSINESS.

On January 2, 1856, or just two days before the date you commemorate as the fiftieth anniversary of *The Iron Age*, I entered the Hardware business as a slender, strippling lad of 16, full of confidence, energy, hope and ambition.

TRIBUTE TO THE IRON AGE.

Just here I pause to pay tribute to your great journal—*The Iron Age*, great in its goodness (or fairness) and good in its greatness—in its constant efforts to instruct, educate, uplift and benefit all connected with Hardware, iron, steel and kindred interests. Every



E. C. SIMMONS.

important line of commerce has its journal or journals, but in no other do I find nor have I observed any that is for the interests to which it is devoted so ably conducted, so fair and impartial, so progressive and up to date, so dignified, so independent and yet so courteous and kindly as *The Iron Age*. I bow my head to its excellence in token of the respect and esteem I have for the manner in which it has been conducted since its initial issue, fifty years ago.

CONDITIONS IN 1856.

To resume—a few words more about Hardware as it was when I made my bow to it January 2, 1856. Files all, or nearly all, came from England. Many and many is the cask of Butcher's, Goodlad's, Greave's and Spear & Jackson's Files that I have opened, there being none made in America at that time. To illustrate in passing the difference between then and now in the matter of putting up goods: The larger Mill and Bastard Files came in one-half dozen (paper) bundles, the 8-inch in one dozen paper parcels and the Taper, or Hand Saw Files, three dozen in a paper package. It was not until 1858, as I recall it, that American Files, made in Providence, R. I., were put upon the market. How well I remember the difficulty we had in selling them; everybody wanted "Butcher's," and it seemed useless to say that these new Yankee made Files were "just as good."

It took a quarter of a century to completely drive out the English Files and supersede them with the American Machine Cut Files.

Almost the same statement is to be made about Hand Saws. The Spear & Jackson Saw, made in Sheffield, England, was then all the go, and it seemed a hopeless task to try to sell any other kind. But in 1865 Henry Disston made and introduced his unrivaled Hand Saws, that are now to be found as the highest type and the best the world has ever known. If there is anything connected with the Hardware business that I am especially proud of it is the achievements of Henry Disston & sons, who have commanded the respect of the universe by the excellence of their products and whose goods are to be found on sale in every civilized country, with the public recognition of all mankind that they are the best that ever been produced.

Griffin Horse Nails (English) had the market entirely 50 years ago. They came in 25-pound bags, the points of the Nails bristling in a most threatening manner through the bag. The price was from 25 to 30 cents per pound. Axes then in popular favor were Collins', Hunt's and D. Simmons', ranging in price from \$12 to \$15 per dozen. Barbed Wire was made and introduced in 1874 in De Kalb, Ill., only a little over 30 years ago.

PRESENT CONDITIONS.

So much for a brief reference to the past; and for the present, let me say that in the manufacture of Hardware and Tools this country by far excels all others for beauty of design, handiness of make and excellence in quality. We ourselves have a well established trade in England, France and Germany for our own brands of goods, where they stand at the top for quality, design and finish.

PERSONALITY.

Let me now leave the subject of Hardware as a general proposition and get into the lines of the "personal note dominant," which you so graciously invited, because I assume that you want a communication from one whose life and personal exertions have been so intermingled with the "events important" transpiring in the Hardware world that something partaking of personal history would be by you considered the most interesting to your thousands of readers—those who prefer to hear of actual events in the varied experience of a successful commercial (Hardware) career rather than any statement of what might have happened, or what will (probably) occur—facts rather than theories. If any statement that I can make shall prove helpful or instructive to any Hardware brother (wholesale or retail), proprietor or clerk, I shall ever feel grateful to you for having extended to me this privilege to appear in your fiftieth anniversary number.

You have encouraged me to believe that there would be no limit to the space I might occupy, and I feel that I could fill every page of your journal from cover to cover by a recital of the facts about Hardware in the last 50 years; but, as you will undoubtedly have many communications telling of those things, I will not occupy more space with those material matters, excepting to call attention to the fact that by comparison of our catalogues we find our goods changing with extreme rapidity and that in ten years more than one-third of our goods become obsolete or are superseded by newer inventions or improved designs driving out the old and substituting the new.

WHEN A MAN DIES

his value to the community and its loss is reckoned by what he has accomplished, what he stood for and what he has most successfully established. As a child, I had a mania for looking at Pocket Knives and would borrow and examine them whenever opportunity offered. On the last working day of the year 1855 I went into the wholesale Hardware house of Child, Pratt & Co. of St. Louis, and saw Mr. Pratt, who employed the help. I said, "Don't you want a boy?" His reply was, "What can you do, my lad?" Quick as a flash I replied, "I can do as much as any other boy of my age. Where shall I hang my coat?" A boy of 16 with a meager common or grammar school education! Mr. Pratt laughed heartily at my quick answer, and said: "Well, my boy, if you work as

quick as you talk, we can use you. Come down the day after New Year's and go to work." Hence, you see I was born into the Hardware business, so to speak, two days before the birth of *The Iron Age*; therefore, I may say I am proud to be the "chang" to your "eng."

HARDWARE WAS THEN

nearly all imported. We had two seasons of busy life—spring and fall; and two horribly dull periods—midsummer and midwinter. In that store (Child, Pratt & Co.) I met John F. Richards of Kansas City, who was there before me, and the friendship formed at that time has lasted to this day, of which I am justly proud, for any man may well be proud of the close and intimate friendship of John F. Richards. From this you will see that I want it known that I am not the oldest jobbing Hardwareman living in this country—"there are others." I am sure my friends Samuel Bigelow of Boston and William Supplee of Philadelphia outrank me in age as a Hardwareman, and Geo. H. Sargent I know is older, and so are J. B. Sargent and Thos. Atkins, but they are manufacturers and not in my class. I do not claim a position as a manufacturer, although we do manufacture some considerable quantities of goods, but I want to be classed as a jobber—that's where I feel I properly belong—and a jobber 9 cubits high and 16 cubits wide, full 36 inches to the yard.

CHANGES.

Our house is responsible for many changes and improvements in the Hardware business that have inured to the benefit of the retail Hardware dealers, especially in the manner of putting up goods, which in my early days all came in papers—no boxes.

There have been seven distinct eras or epochs in the Hardware business in the last 50 years, in which we took a very active part:

- The era of Traveling Salesmen, coming about 1865.
- The era of Special Brands, beginning with a Keen Kutter Axe in 1870.
- The era of Incorporations, commencing 1874.
- The era of Sporting Goods, Guns, &c., added to Hardware in 1876.
- The era of paying salesmen what they were worth, based on their results, or profit sharing.
- The era of Illustrated Catalogues, 1890.
- The first recognized effort to sound the danger signal to the Retail Hardware Trade on the inroads of the Catalogue Houses.
- In 1895 the era of large Hardware house buildings, situated upon railroad tracks for quick and economic service.
- In 1905 the era of branch houses, or going to the trade rather than waiting for it to come to us.

TRAVELING SALESMEN.

We were the first to employ traveling salesmen, as now recognized. Previous to that we sent out men to collect for the goods sold previously and incidentally and occasionally they sold a few goods, but their main business was to collect and they were called collectors—not salesmen—although they sometimes took an order for goods, or rather had an order thrust upon them.

SPECIAL BRANDS.

To be more explicit about these eras or epochs will say that I believe the Special Brand Era began in 1870 with the Simmons Keen Kutter Axe, or more than one-third of a century ago. The importance of this matter can be well illustrated by repeating what one of our best, most competent and most highly valued salesmen said to me within the past 10 days in my office: "The 'Special Brand' line is the salvation of the retail Hardware merchant, because it eliminates catalogue house competition. Why, Mr. Simmons, the most successful men on my route, the men who are making the most money, are those handling and pushing private brand goods." Therefore, if the statement be true, and I think it is, that we originated the "Private Brand" idea and

that private brands are the salvation of the retail Hardware merchants, I am glad, because it in some measure reciprocates the benefits they have conferred on our house by the long continued and liberal patronage, and in some degree cancels the obligation I feel for their many, many years of loyal and faithful friendship.

I have always held that it was the positive duty of the Hardware jobber to do everything that is possibly in his power to help the retail merchant, because their interests are so closely allied that they are a unit; and because the jobber is indebted to the retailer for his very existence and all that he has or has achieved has come from the friendship and patronage of the retail merchant. I would yield to no man living in the matter of my absolute and thorough appreciation of the favors received from the retail Hardware merchant and the obligations he has placed me (and the house of Simmons Hardware Company) under for his long continued support. By obligation I mean that we must do at all times everything in our power, without limit of time, expense, labor or trouble, to help him to prosper.

INCORPORATION.

The era of Hardware incorporation is a most interesting bit of history. Simmons Hardware Company was incorporated January 1, 1874, and was the first commercial or jobbing house in any branch of business in the United States to incorporate. How the fact was ridiculed and jeered at is well remembered by many who are still in the Hardware trade, and the records of the mercantile agencies show that the "experiment" was looked upon with grave suspicion as an effort to evade personal responsibility and liability—in fact it was openly discussed that this new move of "Simmons" was a wicked scheme, preparing for dishonest failure. It is not necessary to speak of what followed, for everybody knows that corporations became fashionable in the Hardware world, both wholesale and retail, and to-day are largely the rule rather than the exception. Perhaps some of your readers have often wondered why there were more corporations in the Hardware line than in any other kind of business, which is the fact. The answer is very easy, because the corporation idea originated with the Hardware merchant, as explained above. Hardware manufacturers were incorporated long ago, but Hardware merchants not until 1874.

PROFIT SHARING PLAN FOR SALESMEN.

The next "era" of importance was the establishment by our house of a profit sharing plan, by which our salesmen participated in the results of their own work; instead of trying to hire them for the least sum possible we did our best to stimulate them to earn as large salaries as possible, to work early and late, to take the 5 o'clock train instead of the 8 o'clock train and to have them feel that if they produced good results they would get their full share of them. We had this field to ourselves for many years, but now the plan is in use by nearly all the houses, so that we are doing business in that respect just as are others.

In this connection it seems but fair to say that more salesmen have prospered, laid up money, gone into business for themselves and become pronounced commercial successes for our house under this plan than any other or any combination or a half dozen others, and all over this country you will find merchants doing a most excellent and profitable business who were formerly travelers for our house, and who loyally and freely express their obligation to us as having treated them fairly and taught them that no business could be successful unless conducted on the basis of integrity, truth and hard work.

GUNS AND SPORTING GOODS.

Up to the year 1881 the Hardware houses of this country did little or nothing in Guns and Sporting Goods, that line being carried by Special Gun houses, but in that year we embarked in this class of goods, putting in a complete stock, and this example has been followed by every large jobber of Hardware in the country until it has become a staple branch of the business.

CATALOGUES.

I think nothing has had a greater influence on the Hardware business than the issuing of catalogues. The pioneer in this (as I recall it) was the house of Markley, Ailing & Co. of Chicago, who got out in 1878 or 1879 a neat and attractive book; but it was not until the issue of our large, complete and expensive catalogue of 1880 that the wholesale Hardware trade realized the illustrated Hardware catalogue era had come and come to stay. Our first book, issued in 1880, was the result of 18 months' most indefatigable work, week days and nights and Sundays, of our late and so greatly lamented friend and companion, Isaac W. Morton, than whom no better or more upright man ever lived.

If I am asked what one thing has most contributed to the success of our house I would reply: "Mr. Morton's catalogue of 1880"—a book prepared without a model to go by, without a guide or precedent to follow, and yet a volume without a single error either in number, page, index, description or in any other way; a book that at once took rank as the "model" from which all others were made, a standard for all to follow. What a wonderful book it was! It cost us over \$30,000 for the first issue and that was to us an immense sum of money at that time, causing us to ponder slowly and heavily as to the wisdom of putting so much of our cash capital into an advertising medium. How our business did grow by leaps and bounds the year we issued that book, the increase in sales being in that year over \$1,000,000.

That book made the business of every retail Hardware merchant who had one larger and more profitable for its use, and I quite believe that the retail Hardware trade of the country could well afford to erect a monument to Mr. Morton's memory for the invaluable and everlasting service rendered them in getting up this book, which has been so largely copied, until now no jobbing Hardware house can be classed as up to date if it does not at intervals issue good and well considered catalogues.

CATALOGUE HOUSES.

What I have just said is to the credit of this question, but there is a debit side and I must be fair enough to name it—viz.: looking back and considering it intelligently, was not the issuing of this book in 1880 the forerunner or suggester of the catalogues now issued by the large and successful catalogue houses of Chicago, which are such a "thorn in the flesh" to us all just now? I fear it is so. "Chickens will come home to roost." This leads me to refer to that ever present "skeleton," the catalogue house competition, and to say that our house was the first to scent the danger in this matter.

A long time ago we noticed that these catalogue houses were attracting an immense amount of attention by most deftly and wonderfully ingeniously worded advertisements on Sewing Machines and Bicycles. These two items were not kept then to any extent by the retail Hardware dealers. The Bicycle craze was on the wane, but the prices on Wheels quoted by these "Arabs" were so far below former figures that they attracted an enormous trade, and the same may be said of Sewing Machines. I gave the matter my personal attention, because I saw great danger to our business if this catalogue habit should grow. I found that most of these Bicycles were "assembled" parts of different machines, put together as best they could and painted up to look well, and that these houses had each purchased from 100,000 to 200,000 of these Wheels.

To defeat that we purchased many thousands of most excellent Bicycles and very good Sewing Machines at a cost to us of \$9 each and issued a circular to the trade, offering them at cost (\$9) and urging them to buy at least a sample—to keep the goods in stock, because the chief argument of the farmer or consumer was that they were not kept in his local market. We urged and urged them to fight this thing early—sounded the danger bell of warning, and even went so far as to ask them to sell the goods at not higher price than quoted by the catalogue houses, which was \$11.75.

At that time the present chairman of the Joint Committee was one of the officers of our company and had charge of our sales department, and no one knows bet-

ter than he does how little response we had to this effort and what a lack of co-operation. Many wrote that we overestimated the importance and the danger—some considerable number who bought the goods found them of such excellent quality that they promptly marked them \$18 each, and thus at one stroke defeated the object we had in view.

We therefore feel that our house was the first to take up this most difficult question of catalogue house competition, and met with scant co-operation or consideration from any one. Nevertheless we have from that day until the present worked constantly and faithfully to do all we could to influence manufacturers not to sell them at all. We don't think any manufacturer should sell them; nor do we believe in any attempt to regulate their prices, because we think the effort will result in total failure.

BRANCH HOUSES.

And now we come to the last era or epoch, and one that we believe far-reaching in its influence and importance—viz., the branch house era. It is a well recognized fact that in many cases promptness is a more important and determining factor in getting business than even price, but put the two together and they are irresistible. Once more I make acknowledgment of obligation to the retail Hardware trade in this way: A merchant of South Dakota who visited us during the World's Fair was talking with me in my office, and when I asked him why he was not buying as much of us as formerly he said: "Well, when you had a strike and your business was badly interrupted I commenced buying some goods in Sioux City, and found that I got them in two or three days after date of order, as against ten days or two weeks from Chicago and St. Louis, and I also found that by ordering little lots I could do my business on less capital if I bought near home."

"Oh, yes!" I replied; "but haven't we a much larger and better assortment than is kept in Sioux City?" His answer was, "Yes, that is so; but they have all I need." I then asked, "Are not our prices much lower than theirs?" He said, "Yes, I think they are; but I make a rattling good profit on the goods I buy from them." He also added, "When I commenced this I had \$10,000 in my business, but I have since taken out half of it and bought me a nice farm home with it in the suburbs of our little city, and I do as much business on my \$5000 by purchasing near home in little lots often as I did before on the \$10,000 when I bought in Chicago and St. Louis. What argument have you against that?" I replied, "I haven't any. If the trade won't come to us we will go to the trade by establishing branch houses in their midst."

That's why we have branch houses and why we believe in them, and that they have come to stay, and like other epochs are a distinct starting point for a new order of things, which will be followed largely just as the illustrated catalogue or the incorporation plan has been followed, and while we are not pioneers in the branch house idea we in a sense are in having a number of them all carrying full and complete stocks, same as are carried at the parent house in St. Louis.

RESTRICTED PRICES.

Our house has always sturdily opposed restricted prices, on the broad ground that we don't think any manufacturer has a right to dictate to us what we shall do with our own property. Restricted prices mean restricted trade and a premium on ignorance, indifference and sloth. We believe in a fair field and no favor. If our customer is smart, shrewd and a hard, early and late worker, paying promptly for his goods and most agreeable to do business with, he is entitled by reason of these facts and his liberal purchases to a better price than some other man who does not possess his good qualities, and who is not up to date or fair in his dealings; and we want to give him a lower price every time and do it voluntarily before he asks for it.

But besides all that, restricted prices are a most evil influence, for most all of them are cut *sub rosa*, and the salesman thinks he is "smart" in the doing of it; and from that he drifts into other questionable practices instead of following the lines of the only road to success, viz.,

uprightness and truth. It saps one of the fundamental lines of the Lord's Prayer, "Lead us not into temptation," for it certainly does lead lots of salesmen into temptation. We are unalterably opposed to restrictive prices and always will be. Competition has caused the greatness of our nation—long may it continue!

ADVERTISING.

Another new phase of the Hardware business in which we have taken a hand is wide and broadspread advertising. We keep a lot of people busy now writing to consumers from the Atlantic to the Pacific in reply to their letters or orders telling them that we never sell consumers (excepting in our retail store in St. Louis, to St. Louis people only) and referring them to their local dealers, and writing all the facts to the local dealers, soliciting their orders at wholesale.

To my retail Hardware friends I would say advertising is in the air; you can't get around it or ignore it. If you compete with catalogue houses you must do some of it or you will get left. It has come over this country like a huge wave and you must not resist it if you would succeed.

THE TRAVELING SALESMAN.

As I may never write another letter for publication I cannot close this one without paying a merited tribute to a class of men for whom I entertain the most profound respect; in fact, speaking of them as a whole or a class, I may fairly say that I love them—I mean the traveling salesmen. It is a generally acknowledged fact that I have employed more first-class salesmen than any other man that ever lived. I don't mean peddlers of Clocks or Ranges, but intelligent, up-to-date, first-class salesmen; and to them my heart goes out in appreciation and gratitude for their efforts and faithful service. Most of my best friends on earth are now or have been traveling salesmen for our house, and in that way have endeared themselves to me for their faithfulness, uprightness and loyalty to this company and to myself.

When your first issue of *The Iron Age* came out, half a century ago, there were no traveling salesmen; to-day there are hundreds of thousands of them constantly on the wing creating business. When they began about forty years ago they were a class of free and easy, jolly, drinking and smoking set of "good fellows," as the term goes, not overly punctilious about morals or the finer points of human life. To-day they are sober, earnest, educated, intelligent, faithful and loyal necessities to every successful business, with one or two exceptions. The name of their friends is "Legion"; they mix well and are great educators. To every retail merchant they are a source of information and help too valuable to be estimated in money.

Among my warmest and most valued personal friends is a man who has traveled for us for many years, during which time his personal sales have reached the enormous proportions of over \$2,000,000, who has always been loyal, faithful and true to the house and myself, and in all that time has never faltered in his work nor flagged in his efforts, and now he has his son with him, teaching him his ways and teaching him to serve my sons as he has served me. Is it any wonder that I love him and would divide my last dollar with him and that I love his class also?

Nothing gives me so much pleasure as to take hold of some young man who has not yet learned how to sell goods, but who is a good bit of material, who is honest with himself and with the house, and really wants to succeed and is willing to work. How I do like to help him! To put forth my hand and have him rest on it and steady himself and regain the confidence in himself that perhaps he has lost; to give him the glad hand of a cordial welcome when he comes in and to thank him for his hard and successful work, if the facts permit me; to teach him that the way to success is as plain as the way to market—viz., that uprightness, truth, fair dealing, hard work and a knowledge of the business is all the "tools" he needs to work with. In brief, to take hold of a poor salesman or a mediocre one and make of him a good one, a crackerjack, a star. I say I love that work; it is my

favorite pastime and pleasure. But if he is not a worker I have no use for him, because I literally despise a lazy man, or a salesman who will take the late train instead of the early one.

Selling goods is the big end of the Hardware business; that's why I attach so much importance to it. Selling creates business; if you don't create you have no business to care for. Many young salesmen start out with the idea that they must be "smart," and are always trying to fool somebody. That's a big mistake. A salesman should never fool anybody; never try to; never take a short cut on a customer; never overcharge him or mislead him; but always try to help him to prosper.

"TWIN BROTHERS."

No other influence in the United States has in the past half century been more potent or successful in uplifting the Hardware trade than *The Iron Age*; no Hardware house more sincerely in earnest in endeavors to elevate and improve the business in which we are engaged than has been our house. Hence it seems fitting that the fiftieth anniversary of *The Iron Age* and myself should be the same and that I should appear in your columns in the hope that some one will call us "twin brothers." The journal that elevates, instructs and commands respect as does yours always is closely akin to the man who develops a great house and in so doing confers a distinct benefit upon society at large and also upon other workers in the same field of human endeavor.

I am so interested in this topic that I could write on and on to an extent that would weary your readers, and must close for fear of "overtrading" on your space by simply asking every Hardwareman to cultivate high ideals, sound, healthy and generous business methods, each trying to make the trade better for his having lived in it.

The sand in my "hour glass" has almost run out. I am no longer active in this business or the determining influence which governs and directs its movements; I am glad to be considered as simply a helper in the ranks, ready and willing to do what comes my way, only asking that the "trouble wagon" be kept from me and that I be permitted to work so long as I am mentally and physically able to do it. I love to work and work because I love it and because it gives me an opportunity to help others to learn quickly what it has taken me 50 years to learn.

E. E. Simmons

JOBGING TRADE FIFTY YEARS AGO.

By A. H. Saxton of Alfred Field & Co., New York.

WHEN your Mr. Williams informed me that your January 4 issue would commemorate the fiftieth anniversary of *The Iron Age* it woke me up to the fact that reckoning from the time of my *entree* into the Hardware field I am one year its senior.

I well remember when the first issue came out. A very small sheet and a very small edition, it was the talk of the town, not because of the small sheet and the small edition, but because the jobbing Hardware trade, then almost entirely centered in New York, saw its ruin in the immediate future, owing to the fact that the proprietor of the new paper had the temerity to

PUBLISH PRICES CURRENT

on leading articles like Spear & Jackson's Saws, Butchers' Files, Ames' Shovels, Maydole's Hammers, Douglas' Axes, Providence Screws, Burden's Horseshoes, &c., and for a long time afterward this feature of the publication was severely condemned. Mr. Williams, however, seemed to know his business, and the paper forged ahead, changing its title once or twice, and finally adopting the present title, now known all over the civilized world.

I have been asked to furnish a few lines retrospective and reminiscent. I do not think I can say anything that will be of much interest to those now on the stage. When

I entered the "field" in 1854 the business of my firm was exclusively confined to supplying jobbing houses with

"BIRMINGHAM" HARDWARE

on order only. No stock whatever was kept. We had a modest but commodious sample room, embracing about everything in the Hardware line that came from that famous old place, to which customers resorted when they wished to make selections. After orders were placed it was from three to six months before the goods could be landed, as all goods had to be manufactured after orders were placed.

The bulk of importations came over in sailing vessels, the average voyage being about a month. There was a sailing clipper named the Dreadnought that made average trips of about 16 days, and there was always a rush for that vessel, as her time was only four or five days longer than the average time of steamers. The freight, per sailing vessels, ran from 12 shillings 6 pence to 20 shillings per ton, while the steamer rate was very firm at 60 shillings. In these later years the steamer rate has frequently been as low as 7 shillings 6 pence per ton.

In 1854 there were eight or nine commission houses like ourselves, all located in New York. As changes came about one after another dropped out, so that 20 years later there was only one left outside of my firm.

VERY FEW WHOLESALE PAID CASH

for their purchases. It was the custom for accounts to be settled with three to six months' notes. There was not then the facilities for learning about the standing of people that there is now, and in most cases it was necessary for a jobber seeking to open an account to be properly introduced. The jobber sought recognition oftener than he was sought after. At the present time a large jobber is looked upon almost with suspicion if he does not pay cash in ten days to secure the provision now almost always made for such payment and promissory notes are about extinct. Also the jobber does not now need any introduction, he is quite able to introduce himself, but is not even called upon to do this; in fact, the life is almost pestered out of him getting rid of those who seek his trade.

THE MODE OF SEEKING TRADE

by jobbers was quite unique and different from the present day. Comparatively few "drummers" were employed, and these not so much on account of the knowledge they possessed of any particular line of business, as for their large acquaintance with buyers. The buyers (generally principals) would come to New York in great droves twice a year to replenish their stocks, and this was the drummers' great opportunity. The country store where everything was kept was in large evidence; in fact, the department store is an evolution from the old country store of my boyhood days. Therefore a country merchant would want Dry Goods, Boots and Shoes, Hardware, Drugs, Groceries, &c.

AN AGREEMENT OR COMPACT

would be formed between, say, half a dozen jobbing firms, all representing distinctly different lines. A suite of rooms would be rented and fitted up in comfortable shape, with ample accommodations for eating, drinking and smoking, and with lodgings even, and drummers from the different houses in the compact would watch the hotel registers for their prey. A dry goods drummer, for instance, would light on a man he knew, take him to the rendezvous and introduce him to the drummers in all the lines of trade represented in the compact. He would be dined, wine, smoked, theatered, &c., and most carefully kept in tow until all the houses in the arrangement

HAD A CRACK AT HIM,

with the result that nine times out of ten he would purchase all his supplies from the firms represented in the association, and the only real competition was one association of merchants working against another association of like character; but when once a compact was successful in corraling their man the case was substantially won and the victim secure.

As buyers came to New York only twice in a year jobbers were kept very busy six months, three months in the spring and three in the fall, and very often were obliged to work their force continuously late in the nights, sometimes all night, until the rush was over, after which there was very little doing for the other six months.

THE PANIC THAT STRUCK US

in the fall of 1857 was very severe while it lasted, and merchants were called upon heroically to stand by each other, which they did, but fortunately the panic was of short duration, so that in the spring of 1859 the trade was again in full blast, and only interrupted by the advent of our Civil War. In 1863 there was a distinct upward movement, which continued with some slight interruptions until the downward movement in 1873 set in, running from bad to worse up to 1878. Those five years of indifferent trade were very trying years all around, and much more disastrous to general business than the panic of 1857.

SCARCELY A REMNANT LEFT.

During my 51 years in the Hardware trade I have found it necessary to revolutionize and reorganize our business many times, and of the large lines of articles we handled 51 years ago for the United States market there is scarcely a remnant left, and we are now in large measure purchasing similar articles made in America for exportation to foreign countries. This reversion of the tide of trade commenced in good strength quite 35 years ago, at which time, taking one line as an illustration, my firm purchased from a Michigan manufacturer in one year \$40,000 of Hay and Manure Forks and marketed them all in Great Britain.

SPORTING GUNS.

Fifty-one years ago the only Sporting Guns made were muzzle loaders. As late as 25 years ago a man from one of our Western States came into my office and in an hour's time left me an order for muzzle loading guns to the value of \$58,000. To-day it would be difficult to give away muzzle loading Guns. When breech loading Guns first came on the market I sold a certain grade in quantity for \$36 each. I have since sold an equal quality breech loader at \$9 each and some of the lower grades have been down to \$4 to \$5 each.

BANK FACILITIES

in the old days were comparatively very meagre, and opening an account with a bank was often surrounded with serious difficulties. Then the merchants ran after the banks and were fortunate if they obtained recognition. Now the banks run after business and constant solicitation of accounts is going on by letters and personal applications. Therefore, half a century ago, it was quite customary for firms to borrow money from one another when short of funds and I have in distinct remembrance two firms in the Hardware trade whose chief partners made borrowing a business, borrowing one day from Peter to pay Paul the amount borrowed the day before.

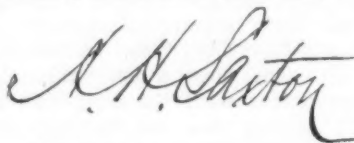
I remember a firm applied to another firm for a loan of \$1000 for 10 days. It was stipulated that the loan be made provided the applicant would purchase an equal amount of merchandise. This was agreed to, the check and goods handed over, but before the expiration of the 10 days there was a failure and the lender came to the conclusion that he had been too anxious to make a sale.

OLD TIMES CHERISHED.

I rather liked the old times. One merchant came in immediate contact with another merchant. I suppose I knew personally up to 20 years ago the heads of the bulk of the jobbing Hardware houses in the United States. Now I must send travelers to professional buyers and gentlemen composing firms seldom ever meet each other. These later days are altogether more strenuous than the old days. People do not have as much leisure, their time is more occupied in devising ways and means to keep their end up. Generally competition is more fierce.

and merchants are now fighting more for a sale of \$100 than formerly for a sale of \$1000.

At the same rate there have been immense improvements in methods and facilities of doing business. No one can now run a business of any volume without stenographers, telephones and ocean cables; the facilities for duplicating documents enable one person to do the work of four. The improved methods of keeping accounts and proving their correctness make it easy for monthly balance sheets and on the whole, if I had come on the stage 25 to 30 years later, I do not think I would have any sentiment or regret in bidding adieu to 50 years ago.



GREAT INDUSTRIAL AND COMMERCIAL EXPANSION.

By Henry R. Towne, New York City

ALTHOUGH my experience as an engineer, manufacturer and manager covers something less than the 50 years during which *The Iron Age* has fulfilled its many useful functions it is sufficiently long to make me realize and appreciate the great changes and advances which have occurred during that period in all three of the fields in which I have had experience. Undoubtedly

THE MOST DISTINCTIVE CHANGE

is in the great increase in the size of units, whether industrial or commercial, due to specializing, concentration and consolidation. A business or enterprise deemed large 50 years ago would to-day be of small account, while those which are large according to present ideas are greater than anything dreamed of 50 years ago. The tendency thus implied is more marked and more potent to-day than ever before and we may safely assume will not be less in the future. If so we must assume that business, whether of production, transportation or distribution, will continue to crystallize into larger and larger units and that the difficulty of conducting small undertakings successfully and profitably will increase.

Where competition prevails this should result in lower cost to the consumer and sometimes without impairment of profits. Where competition is eliminated the consumer may suffer, but usually not long, as the condition thus implied operates to correct itself. On the whole the consumer fares better under present conditions than ever before.

ANOTHER AND PARALLEL DEVELOPMENT

is the increasing tendency in every field of industry to associated regulation of joint interests, whereby better results are realized than would be possible from individual and unconcerted action. Where this creates a monopoly which misuses its power the consumer may suffer, but usually finds a remedy. Where it results, as it frequently does, in increased economy and efficiency the consumer is benefited sooner or later.

On the whole associated control by promoting stability of values, economy, concentration and a freer exchange of experience and knowledge tends to benefit the community, and therefore we may safely assume that this tendency will increase and continue and that so far as it makes good its right to exist the law where it now interferes will be modified accordingly. Already this is foreshadowed in the case of the pooling of railroad business, which, it is beginning to be perceived, may not only be permissible but directly beneficial to the shipper as well as to the carrier.

IN THE HARDWARE INDUSTRY

the past 50 years have witnessed enormous development in the employment of machinery, even of the most highly organized kinds. Where formerly the product was made chiefly by hand, or by machinery of the crudest kind, it is now produced chiefly by mechanical operations and largely by automatic machinery of the most expensive

character. The result has been constantly to reduce the cost of product and at the same time to elevate the standard of quality, until to-day American Hardware leads the world in mechanical excellence and is sold at prices which are enabling it steadily to capture business in foreign markets.

UNLIMITED OPPORTUNITY FOR FURTHER PROGRESS.

In the industries of which *The Iron Age* is the leading exponent the past constitutes a record of progress and achievement of which all may be proud; the present exhibits an intensity of activity beyond all precedent, and the future holds forth the promise of steadily increasing opportunity at home and abroad to the American producer, carrier and distributor. For each and all in their chosen fields there will be almost unlimited opportunity for further development, so long as this country continues to enjoy the bounty which nature has lavished on it, and its citizens continue to maintain and exercise their present industrial aptitude and energy and to make wise use of their accumulated experience in the organization, application and management of their business undertakings and especially to avail of their increasing experience in co-operative effort.

In the expansion of our export trade further progress will be greatly promoted in my opinion by a lowering of the barrier which our present needlessly high tariff constitutes and by a more general recognition of the economic fact that business constitutes an exchange in which one party or country cannot permanently absorb by purchase more than it can pay for by sale.

FIFTY YEARS IN THE HARDWARE BUSINESS.

By Samuel A. Bigelow, Boston, Mass.

LOOKING back 50 years it seems but a short time, but looking about us one is struck with wonder at the changes that have taken place in the Hardware world since the early fifties.

David Williams' address before the American Manufacturers' and National Hardware associations at Washington in November last told of the conditions existing in 1855, when *The Iron Age* was in its infancy, and how it had progressed with the growth of the Hardware trade of America.

Founded on the broad principles of honesty and fair dealing its founders may well be proud of its standing as the leading exponent of the Hardware interests of the world. Those whose lives have been devoted to the upbuilding of *The Iron Age* are richly deserving of all the kind words and congratulations that will be showered upon them on its fiftieth anniversary.

It is hardly more than 50 years since nearly all the stock in a Hardware store was imported. As boys some can remember when Nails came to us packed in gunny bags, with the sharp points sticking out in all directions like a porcupine.

GREAT CASKS OF ASSORTED HARDWARE

containing Chain of all kinds, Wrought Tea Kettles, Wrought Thumb Latches, Fry Pans, Sad Irons, Files, Spear & Jackson's and Groves & Sons' Hand Saws, Cutlery, Door Locks, Padlocks and numberless other articles of foreign manufacture were imported each spring and fall.

All shelf goods came in paper packages and it was a long and tedious task to open and sample each bundle and after a busy day to tie up the numberless packages that strewed the "ledges" at night.

LIMITED VARIETY.

The variety of Hardware sold in those days was very limited. Cheap Rim Knob Locks and Iron Face Mortise Locks and Latches were staple and in general use. The builder who used Brass Face Locks and Latches and Octagon Glass Knobs was near up to the limit.

There was no use then for the bulky catalogues now needed to show the numberless articles and great variety of goods sold in a Hardware store to-day.

The writer was very much interested a few weeks

ago when he visited the great works of P. & F. Corbin, now employing many thousands of workmen, and in a conversation with Philip Corbin, its founder, whose first venture as a Hardware manufacturer in 1849 was to make Ox Balls, which he took to market in a meal bag and sold himself.

He also showed the writer a copy of his first catalogue, published in January, 1852. Some of the goods catalogued were made by others and sold by him, but all that he made was—

Flush Bolts,	Tin Trunk Handles,
Ox Balls,	Brass Screw Hooks,
Brass Lifting Handles,	Brass Cabin Door Hooks.
Cupboard Catches,	

He was his own salesman and told of an old fashioned Boston merchant who looked over his samples and, being asked for an order, replied: "No! I don't approve of manufacturing these articles in this country. I shall continue to import my stock from abroad."

THE CONSERVATISM AND PREJUDICE

of this merchant were so universal that Americans had a hard fight to supplant goods of foreign manufacturers.

When the Whipple File Company made the first Machine Cut Files but few customers would buy them, preferring the English hand cut for many years.

Henry Disston made a strong fight and expended much personal effort before he supplanted English Hand Saws.

In August, 1846, Swan patented Gimlet Pointed Screws. Before that all Wood Screws were blunt pointed.

In 1854 the production of pig iron in America was only 736,000 tons. In 1856 the Bessemer process for making steel was first introduced.

A MARKED EPOCH.

The late forties and the early fifties were a marked epoch in the Hardware and iron industries of America, for they commenced then the fabulous growth which is the wonder of the world to-day.

The Iron Age was in at the birth and let us hope it will continue to the finish. No one will gainsay its just claim, that it has always labored and worked to bring about the results for which we as a nation are so proud to-day.

The present flourishing condition of the Hardware jobber owes much to the industry, the honesty and sound business principles of the merchants of the past.

CONSIDERED DISHONORABLE THEN.

A friend telling of his early experience, related an incident where he sold a neighbor's customer and was told by his employer that it was dishonorable and next to stealing, and cautioned him *never* to do so again.

Small sales and large profits were legitimate. Rents of a few hundred dollars a year and a few clerks, aided by the employer, who never failed to do his share, kept the expense account at a minimum.

"THREE FOR ONE."

The almost universal selling price for English goods was "three for one"—that is, an article costing 1 shilling sterling in England was sold for 3 Yankee shillings (50 cents).

Files and Chisels were sold on the basis of \$5 to \$6 per pound sterling.

Then there were no manufacturers' lists sent broadcast to the customers, who came to market once or twice a year and depended on their own judgment as to values and their confidence in the salesman in making their purchases.

No typewriters, no telephones and no adding machines were necessary for conducting a profitable business in the past. Salaries were small, the hours were long and the labor tiresome and exacting. Later on these clerks drilled and educated in the East

DRIFTED AWAY TO THE WEST,

where they found ample opportunity to expand with the rapidly growing country and made honorable records in

helping to establish the great industrial enterprises which make the Hardware and Iron interests of America so important to-day.

To those whose active business life extends back to the fifties and who have followed the Hardware business day after day and year after year, while these wonderful changes have been wrought,

COMES A FEELING OF PRIDE

that they have been privileged to live and take however small a part in the great progress of the past half century.

Few of the older merchants are now living and few have recorded their early experiences, which might benefit and help the younger man of to-day. Would this not be an interesting subject for *The Iron Age* to develop for the benefit of its many readers?

FROM A HARDWARE MISSIONARY'S POINT OF VIEW.

By One of the Old Guard.

WHEN I met the Hardware editor of *The Iron Age* a short time ago at the Hardware Club and he asked me to write something for the fiftieth anniversary issue my vanity was tickled, and I promised without hesitancy to send him something, just as though it was my business to write newspaper articles to order instead of to take orders for Hardware. Now that I am trying to "write something" and do not find ideas flowing thick and fast that case of vanity is subject to a tack discount.

Another thing that has taken quite a little of the conceit out of me is that I have just realized that one of the reasons why I have been asked to contribute is because there are so few left of the "Old Guard" for the editor to call upon. I can count on the fingers of one hand all the Hardwaremen now traveling either for themselves or for other manufacturers who were on the road, say, 40 years ago, when I made my first trip, and was so young and bashful I would pass by a store half a dozen times before I could summon the necessary courage to go in and meet the buyer. There was a time when it seemed just a little funny to have some one come up, slap me on the back, and say: "How are you, Old Man!" Now such greetings are totally lacking in humor!

A GOOD WORD FOR THE BUYERS.

In looking back over these 40 years of missionary service among the Western Hardware jobbers I can recall little but kindness and consideration on the part of the buyers. When I was a young man and blushed like a girl the buyer had pity on me and tried to make me feel comfortable. Now that I am one of the "White Travelers," and the buyers are in many cases my old friends, I appreciate their cordial greetings and considerate attention more than they perhaps realize. I was never quite such an idiot as to expect that any one, however much my friend, would give me the business unless my price was at least as low and the quality presumably as good as that offered by a competitor. Had I discovered such a badly regulated buyer I should have at once obtained a report from a mercantile agency.

WE HAVE SEEN MANY RADICAL CHANGES

in the conduct of business during these forty odd years. Most of the changes are for the better, but there is one innovation that came in not quite 40 years ago that does not seem a blessing to many, and that is the pooling system. Perhaps my experience has been less fortunate than some other salesmen and manufacturers, for although I have had a good deal of pool experience, in only two instances have these agreements been a lasting benefit to the manufacturer.

I WAS NEVER IN ANY POOL

that was honestly lived up to by all the members.

It is a hard statement, but it is nevertheless absolutely true that many a man who has an inborn hatred of a lie

deserves to be elected president for life of an Ananias club soon after he joins a pool. I recall certain meetings of one of the older pools—meetings which a friend of mine used to say were "called for the purpose of swapping lies."

One member of that pool was a deacon of long standing. I believe in matters outside of the pool he was an honest man, but he was consistently crooked in all things connected with that pool. He made speeches to us that were as soft and placid as a mountain lake on a still, summer night. I think his secret definition of a pool would have been something like this: "An agreement between manufacturers to enable a fellow to prey upon the trade of his competitors."

I never could listen to that deacon without recalling those two well-known texts, slightly mutilated: "The Lord loveth a cheerful liar," and "A lie is an abomination unto the Lord, but an ever present help in time of trouble." At one of our pool meetings the deacon seemed to forget for a moment where he was, for he said at the end of a sweet little speech: "Let us pray." I made him dislike me ever afterward by asking him if he spelled it "prey." In most pools one cannot even use that rather low code of morals as expressed in the axiom, "Honesty is the best policy," for the honest manufacturer is the one who is sure to be the loser.

To be in a secure position a manufacturer must in the end depend largely upon his sagacity, methods of manufacture and selling, and his general good common sense rather than upon those artificial means of pools, gentlemen's agreements, &c.

THE CATALOGUE HOUSE.

I had made up my mind to fight shy of the catalogue house question. We have had so much talk on this subject that I know there are at least a few jobbers who are of the opinion that there has been too much said already. I will venture a few remarks, however, as the subject seems to be in the air and no one escapes it. Notwithstanding that Hardwaremen individually and Hardware associations collectively have furnished the catalogue houses much free and most generous advertising, the Hardware business done by those who cannot be called legitimate Hardware merchants is but as a drop of water in a bucket when compared to the total volume of Hardware sold.

I doubt whether any one of us lives to see the day when the catalogue houses will do 5 per cent. of the Hardware business. Everybody knows that the small illustrations used by the catalogue houses give a very imperfect representation of the articles offered for sale, and that any one would rather see and handle a Knife, Saw or what-not before purchasing instead of depending upon those little cuts.

ONE OF THE MOST FOOLISH THINGS

a man can do in this world is to try and fool himself into believing what in his heart he knows is not true. Does any Hardware jobber or retailer really believe that catalogue houses will cease to exist? I imagine these catalogue houses, like the poor, will be always with us, and that the jobbers and retailers of Hardware will meet the conditions. Even now it will be found that with the cost to the consumer for express or other transportation charges added to the price advertised by the catalogue houses the retailer can compete successfully on almost all articles.

THERE WILL ALWAYS BE FOUND

manufacturers who will sell these catalogue houses, and there will also be a great many who will not. Just why a manufacturer who is doing a good business with Hardware merchants should want the catalogue house trade seems strange to me. I represent two manufacturers who sold catalogue houses seven years ago or longer, but even before this subject was much agitated it was decided to drop the business. There was no pressure brought to bear on us on the part of Hardware dealers. We simply decided for ourselves that our Hardware jobbers gave us a satisfactory and sufficient outlet, and that the catalogue houses could not increase our business any worth speaking of.

Now that there is such a strong sentiment on the part of Hardware dealers that Hardware manufacturers should confine their sales to legitimate Hardware houses. I don't see how a manufacturer

CAN AFFORD TO RUN CONTRARY

to the wishes of his best friends—namely, the Hardware dealers. In the case of the two lines which we sold to catalogue houses years ago, the business amounted to less than 2 per cent. of our output. I think many manufacturers will find on figuring that they are doing no larger percentage of their business with these catalogue houses.

I know that some of the manufacturers are very much at sea on this subject, and scarcely know what to do. They seem to be as much puzzled as was Pat, who, when asked what time it was, replied: "Half-past six, I don't know; dummied if I do, do I?"

CORDIAL RELATIONS BETWEEN JOBBERS.

From a traveling salesman's point of view: What are some the most notable changes that have come to pass during these 40 years or longer? To me, one of the most striking changes is the present cordial relations that exist between the jobbers in the same city or territory, as contrasted with that old feeling of antagonism that prevailed in years that are gone. In how many cities was the visiting salesman prohibited selling the "other house." It is a rare thing to find any such feeling now. Then there were certain buyers who would say to us, "That may be all right for the general jobbing trade, but what have you up your sleeve for us?"

Another change for the better, and that saves the traveling salesman time and labor, is the writing of orders on typewriters. We had some very poor penmen in those far-off days, and often I sat up well into the night copying orders to send to the manufacturer, being fearful that he could not decipher the originals—and my writing was none too plain, either. Another very noticeable change is that there is now scarcely any

"GOING OUT TO SEE A MAN"

during business hours. I might almost be safe in saying that there is no drinking indulged in during the day, and scarcely any at any time between the buyer and salesman. It was not so in ye olden times.

And how generally American Hardware has supplanted the foreign article in these 40 years! I once carried a line of Birmingham Padlocks, and they were great sellers. I wonder how they would sell now.

And what a wonderful change has taken place in the business offices and warehouses of Hardware jobbers! These improvements go right on year after year, and there is no such thing as stopping them.

And there are the improvements in railroad travel and hotel accommodations. I have many times traveled on sleeping cars that were simply ordinary day coaches with the backs of two seats turned in opposite directions and a few boards with hard mattresses thrown across. At most hotels a man who would ask for a room with bath would be looked upon as putting on airs.

SOME POINTERS FOR NEW TRAVELERS.

At the risk of being thought pedantic I will venture giving a few hints to the new travelers who are taking the place of the older men so fast:

1. When you visit a city and fail to do a satisfactory business, don't write to your firm that the prospects for trade in that city in the near future are fine, and that you will do a large business there on your next visit.

2. Don't talk about your business at meal time. Both business and politics should be dropped at the public table.

3. Don't travel so fast that you leave a town before you have done it justice. Your firm has not sent you out to see how much ground you can cover in a given time, but how much Hardware you can sell in the cities covering your route. Some salesmen begin studying the time tables as soon as they reach a place to see when they can get

away. Business, not speed, is what the firm is paying your salary and expenses for. Don't imagine yourself a human automobile; if you do, you may be blown up.

4. When you find a salesman of a competing concern has taken an order that you had banked on, don't write your firm that so and so cut prices fearfully, and in that way got the business which "your friends would surely have saved for you, but for the ridiculously low prices made by said competing salesmen."

5. If you are selling Cutlery as well as Hardware don't think it a hardship to get out your samples of Knives. Orders for Nails, Carriage Bolts and other staples are all right, but your concern appreciates Cutlery orders. Don't, for example, go into the store, and after selling staples, say to the buyer: "I suppose you do not need any Cutlery to-day." The chances are he will say, "I guess not," while if you show him your samples he will very likely see something he wants.

6. If you send in an order at a cut price it is braver to acknowledge that you did it to get the business rather than to say you had to cut prices to meet the quotations of the "other fellow."

7. Don't say too much about your being able to control certain trade provided your prices are no higher than your competitor. There are no Hardware buyers who mortgage themselves even to their nearest friends.

8. Never talk against a competitor, either against him personally or his wares. It is enough for you to show up the merits of your own lines and keep your own hands clean.

There's so much bad in the best of us,
And so much good in the worst of us,
It hardly behooves any of us
To talk about the rest of us.

9. Don't think because you are away from home your conduct is not a legitimate subject for criticism and that your example counts for nothing. Be and act the gentleman; try and do some good as you go along. Be courteous to everybody, even to your waiter or bootblack. Instead of abusing the railroad when your train is late have a good book always at hand—so much reading can be done at odd moments.

10. Avoid submitting propositions to your firm. If your experience thus far on that trip makes you reasonably certain that your prices are low enough, don't unsettle your concern by telegraphing an offer. You are on the ground and should know what you must do. The fact of the buyer making you a lower proposition does not prove that he can buy at that price from one of your competitors.

11. Don't talk too much. The day is past when the garrulous salesman is appreciated. Come to your point quickly.

12. Be strictly truthful. Never jockey with prices. Give your customer the price you are willing to take. In other words, make your own price instead of letting your customer make it for you. If you name a higher price than you expect to get you will have trouble every time you call on that man, for whatever price you name on future visits he will think you are holding back something and will try to beat you down. Better lose an order occasionally than acquire the reputation of being a jockey.

13. Go to church. While you will hear some sermons that are "fearfully and wonderfully made," you will also hear many good ones and listen to much sound, kindly counsel. In a majority of cases you will hear good music. So instead of staying at the hotel and talking business

go to church at least once every Sunday. It will take your mind off of "shop" and help you in the best way.

You will find this a very good world if you do your part to make it so. As Dean Hodges says: "This is, on the whole, a pleasant planet, and the great majority of us are glad we came here to live."

THE EVOLUTION OF THE HARDWARE STORE.

By W. P. Bogardus, Mt. Vernon, Ohio.

THIRTY-FOUR years in business is a long time to look forward to, but a brief span as you look back. I remember my first trip to New York. I was a green country boy. I never had been a salesman and knew nothing about business. A little catalogue of Jas. L. Haven and one of Russell & Erwin Mfg. Company were all the text books I had, and I read them over and looked at the illustrations, and so judged what should be bought to go into a Hardware store. For I had made up my mind that that was the only business I cared to engage in. I had a credit of \$3000 to start with.

WHEN I ARRIVED IN NEW YORK

I did not know a soul in the city, but somehow I got into the street where the wholesale Hardware stores were. I walked by several and looked in. They were not very inviting; cluttered up in front, with little windows not often cleaned. But finally I got up courage and went into Hart, Bliven & Mead's store. I made my business known and a salesman was assigned to me and we wandered over that store for three days buying goods. To buy as little of a kind as I could so that my money would get as large a variety as possible I had made my mind up to do before I reached the city. Of all that I bought at that time

NOTHING IS LEFT

but one dozen Ox Bow Pins. There were no oxen here, so I could not sell them. I am sure if I had that stock now that there would be many items that would not easily be sold. Goods that went into the manufacture of furniture and carriages have mostly disappeared from the ordinary Hardware store. Casters and Bed Irons, that once were bought in large quantities, are now seldom called for.

The changes that come to men as the years go by have come to the trade in the Hardware store. Most glass sold is already glazed. Broad Axes have disappeared. I have always felt that a large assortment and a clean stock were good advertisements. My competitors used to say that I put all my stock in the windows. I was the only Hardwareman who had plate glass windows in which to show goods.

MY OPPORTUNITIES TO ADVERTISE

that way taught me that the information that goes into a man's head through his eyes is apt to stick. Of course, the hard work that goes with learning and building up a business for the store goes without saying. There was never any drudgery in the business for me. It was always a pleasure. While some lines of goods have disappeared from the Hardware store others have come to take their places. Guns and fixed Ammunition and Loaded Shells have come to cater to the huntsman's desires. The old Muzzle Loader and the Cow's Horn to hold the Powder are things of the past.

And when the early spring days come the men and boys who love to fish are tempted beyond the power of resistance by the array of the modern fishing outfit. And as I sell these goods I have learned to know that the necessities of humanity are not half so insistent to be gratified as the pleasures, and the price is given more readily for them than for necessities.

IN THE EARLY DAYS

one showcase was enough to show a few small articles. Now the counters are covered with cases and the boxes on the shelves are sampled with the things that are inside.

and the eye is catered to and invited to look, with the hope that it will breed a longing for the things seen.

The conveniences that have become necessities are innumerable. To keep things hid under the counter is not considered up to date business. But to show what you have, to attract all the attention possible, so as to have the goods act as silent salesmen and to make the store as attractive as possible are some of the things to be practiced by the modern Hardwareman.

The cash register has taken the place of the old fashioned money drawer, and to look at the records is to know how much money there should be in the drawer, who has made the sales, in what kind of goods business has been, and when the store was opened in the morning. What would have been regarded as

EXTRAVAGANCE IN FIXTURES

is now looked on as a necessity. The old dimly lighted store has passed and the brilliantly lighted one has taken the place.

I remember when I first opened my store that about the best Lock I could sell was a brass faced mortise Lock with porcelain knob and roses, with keyhole escutcheons separate. The beauty of modern Hardware is in great contrast with what it was 30 years ago, and is one of the marked changes.

THE WONDERFUL INVENTIVE CAPACITY

of the American has helped to make the Hardware store of the present one of the most interesting stores to visit. Genius and art have combined to make the contents of a well kept Hardware store a delight and a surprise; delight because of the useful things brought together; surprise that with all their usefulness they are so beautiful. The inventive faculties have not been satisfied to stay their work when Builders' Hardware was made a thing of beauty, but have gone on to improve tools, so that the mechanic is able to do his work easier and better than ever before.

The old Wooden Chopping Bowl and the accompanying Knife have been discarded for the modern Meat Cutter. And the farmer no longer goes to the woods to split rails for his fences, but comes to the Hardware store and gets his fence ready made to put in place. So there is an

ENDLESS VARIETY OF THINGS

made for the comfort and convenience of man to be found in the modern Hardware store. Men seem to delight to mold things in metal that are useful and helpful.

With all the improvements in store fixtures and surroundings has come the necessity for a closer watch on all the possible leaks. The little economies are closer studied. Bookkeeping is more of a science. Accounts are watched with greater care, and merchants are realizing as never before that cash in the drawer is much to be preferred to accounts on the books.

MODERN ORGANIZATIONS.

both State and National, are making their mark on business and business methods, and Hardwaremen delight to tell the others what methods they have used to bring success. Competition has lost its bitterness, and merchants realize that they have something to accomplish that can only be done through united effort.

HONESTY IN BUSINESS.

I think that the large majority of men are honest, but we need as good citizens to set our face strongly against the idea that seems to crop out in our big corporations that it is results that are wanted, and the means will not be closely inquired into. There is no man who makes his life a success unless he is honest. Money disappears; character withers, and men fall from the highest places and their old age is full of bitterness, for their sins will surely find them out. But integrity stands. In these modern days a word of caution may not come amiss. Practical morality is a necessary part of true business, and there is no more potent force to educate the people than the business man.

H. A. Bogardus

THE HARDWARE TRADE OF THE SOUTH.

By R. M. Dudley, Nashville, Tenn.

THE Hardware business 50 years ago is a subject that I am not supposed to be thoroughly versed in, as I did not discover America until a few years later, so you see I was only a boy when our venerable friend, S. A. Bigelow of Boston was celebrating the fiftieth anniversary of his entry into the Hardware business. I fear, however, I have made a mistake in disclosing my age, as I run the risk of losing my title of colonel, which was so graciously bestowed upon me by my friend Fernley. While I did not have the pleasure of studying lists and discounts or reading *The Iron Age* 50 years ago my grandfather was manufacturing in a crude way Farming and Mechanics' Tools in Tennessee more than 75 years ago.

GREATEST CHANGES IN THE SOUTH.

Fifty years have doubtless wrought greater changes in the Hardware business in the South than in any other section of our country. The retail Hardware business in this section before the Civil War was done almost exclusively by the general stores, as regular retail Hardware stores were very scarce; but even at that early date the Hardware jobbers carried fair assortments of Hardware, most of which were imported.

The principal customers of the retailer were the large slave holding planters, some of whom, on account of the magnitude of their business, ran stores or commissaries of their own, and were permitted to buy from jobbers. These retailers, many of whom are still living, delight to tell of the times when they went in their private conveyances more than 1000 miles to Philadelphia to make their purchases.

The business of this country was almost exclusively done on a credit basis, and no greater commercial insult could be offered one of these planters than to ask him for payment of his account before the close of the year, and usually he paid at the end of the year, not demanding a statement of same.

TO ILLUSTRATE THE LAX METHODS

of doing business in those days I have frequently heard the following story told, which is no doubt founded on facts:

A merchant doing a large business and employing many clerks on a certain busy day missed a Saddle that could not be accounted for. The supposition was that one of the clerks had sold and failed to charge it. The proprietor instructed the bookkeeper to charge the Saddle to every man on the books, expecting the one who got the Saddle to pay for it, and that the others would ask credit for it on settlement, but to the surprise of the merchant they all paid up in full.

IN THE EARLY DAYS

the proprietors of the Hardware jobbing houses did most of the work themselves; but few letters had to be written; no traveling men had to be looked after, and the proprietors usually, after selling a bill of Hardware, got it out, had it packed and shipped, and made out the invoices themselves. This custom to a great extent was in vogue when I entered the Hardware business in 1878.

I am sending you a copy of an invoice of Alexander Fall & Gray, dated April 8, 1864, and a copy of the license issued by the United States authorities under which these goods were sold.

[Mr. Dudley has favored us with a photograph of the invoice and license, but we regret that we are unable to reproduce it satisfactorily. We give, however, below the wording of the special license.]

SPECIAL LICENSE TO SHIP INTO INSURRECTIONARY STATES AND DISTRICTS.

Under the proviso of the 5th Section of the Act of Congress of July 13, 1861.

PORT OF NASHVILLE, TENN.

This may certify that Kimbro & Co. has this day filed in my office an application for permit to ship from this port to Murfreesboro to be delivered to same by way of wagon, the goods wares and merchandise mentioned and described in the triplicate invoices thereof hereto attached (each one of which is stamped with my official seal) which are contained in three packages and

are of the aggregate value of \$97.71 and owned by same, shipped by same, consigned to same.

And the said Applicant has filed in my office copies of the original invoices of the said goods, wares and merchandise and made oath before me pursuant to the Regulations of the Secretary of the Treasury, and the local rules and restrictions of the Supervising Special Agent of the Treasury Department.

Now, therefore, by virtue of the authority of the President of the United States through the Secretary of the Treasury, in pursuance of the proviso of the 5th Section of the Act of Congress, approved July 13, 1861, entitled "An Act further to provide for the collection of duties on imports and for other purposes," I do hereby authorize and permit the said Applicant to transport by the route above named the said goods, wares and merchandise to the above named place, and there to dispose of the same in pursuance of the regulations and of the local rules and restrictions aforesaid; Conditioned, however, that neither this License nor any shipment made under it shall with the authority, connivance or assent of the said Applicant be so used or disposed of as in any way to give aid, comfort or encouragement to persons in insurrection against the United States.

The right is reserved to revoke, suspend or modify this license at such time and in such manner as the public interests may require. * * *

[Then follows statement of fees imposed, signature of Surveyor of Customs and seal.]

J. M. Gray, Sr., who was the junior member of this firm and who is now a senior director of our company, sold this bill of Hardware, got it up himself, and the invoice is made out in his handwriting, which is so familiar to many of the Hardware manufacturers of the East. The firm of Alexander Fall & Gray was succeeded in order by Gray & Kirkman, Gray, Kirkman & Co. and Gray, Fall & Co., the latter consolidating with Dudley Bros., forming our present company.

Mr. Gray relates many incidents of interest connected with the early history of the Hardware business in Nashville. The first Hardware drummer that ever came to Nashville represented the Philadelphia branch of the Russell & Erwin Mfg. Company—this was a few years before the Civil War. Collins' Axes were then selling in Nashville at \$14 per dozen. Mr. Gray frequently speaks of the time when he bought Cotton Cards from Geo. H. Sargent at \$18 per dozen and sold them at \$36 per dozen.

ONLY WITHIN THE PAST DECADE

have the retailers of the South fully appreciated and seized the opportunity of greatly extending their lines of goods by beautifying their stores and adding many lines, some of which have been of interest to the ladies and which usually have proven to be profitable goods to handle.

While advancement and improvement have been the watchword and the order of the day and rapid strides have been made in all branches of the Hardware business, I am glad to congratulate *The Iron Age* on its fiftieth anniversary, and on having kept fully abreast with this advancement, and being recognized as the leader in promulgating advanced ideas and as the advocate of up to date methods; and, in fact, fully alive to everything that affects the interest of the Hardware trade. I wish you a Happy New Year and continued success and prosperity.

R M Dudley

CONDITIONS IN 1856.

By Gaius Paddock, St. Louis, Mo.

IT affords me pleasure to review briefly the changed conditions of the Hardware trade for the past half century, in accordance with your request. In doing so it brings very forcibly to my memory the first visit of John Williams to the West, in 1856. His pleasant address and business tact of the highest order won him many friends with the trade and the unquestioned faith he had in his mission was clearly shown by the success which he afterwards achieved. This marked a new epoch in the trade, which was in its infancy.

HARDWARE STORES WERE BUT LITTLE KNOWN

except in the larger cities. The stock of Hardware in the average country store consisted of a few leading articles occupying a few shelves in the back part of the store.

This stock consisted mostly of Nails, Axes, Hinges, Saws, Tools, Files, Knives, Forks and Cutlery; the last mentioned were all imported from England and Germany. Very few French goods were known to the trade.

Orders for importation were given from nine to twelve months in advance. Spear & Jackson's goods led the market in Saws and some other tools and the challenge of the Disston's to the world to produce a better, or equal Saw, marked a revolution in this industry, but it was taken at first with very grave doubt by the general trade. W. & S. Butcher's Edge Tools were the only goods that were handled to any extent.

THE FOREIGN MANUFACTURERS

had it all their own way, both in quality and prices, and to contend against or question the grade, was considered heresy and the complainant was branded a "know-nothing."

And when in future years the finely finished goods of the leading American manufacturers came upon the market, with better shape and finish, some of the larger Hardware dealers sent the makers in England and Germany samples requesting them to furnish stock of similar shape and finish, duplicating the samples sent them, but the results were disgusting and unsatisfactory and after repeated efforts the foreign makers acknowledge that it was impossible to have the new patterns duplicated, as the old patterns had been produced for years by their fathers, grandfathers and great grandfathers and could not be changed.

HARDWARE PRE-EMINENT.

No branch of industry or trade has made the same relative progress in the past half century as the American manufacturers of all kinds of Hardware. The changes have been most marked in the commercial world. We can hardly realize what great changes have taken place during this time. The methods of business have undergone the same comparative changes, and with the highest order of correct system and the best talent to be obtained the general tone of trade from the Atlantic to the Pacific has kept pace with the growth of the industry and is leading the world in both quality and quantity.

I cannot close without adding my admiration of the liberal and broad views your worthy publication has shown without biased judgment to both manufacturer and dealer during the half century of your publication, with the hope that the success you have attained will continue for years to come and that your valuable journal may be as necessary an agent to the trade in the future as it has been in the past.

Gaius Paddock

OUR GREAT INDUSTRIAL MECHANISM.

By Wm. M. Pratt, Greenfield, Mass.

YOUR request for a retrospective article furnishes an opportunity for interesting comparisons and in congratulating *The Iron Age* upon its golden anniversary the business interests of this country are to be congratulated as well on the great commercial strides that have been taken.

THE MORAL STANDARD.

Let us for a moment overlook the errors and shortcomings of those great combinations of capital styled "trusts," which have not always proved a blessing in disguise, realizing bad things are often given prominent places and good ones entirely overlooked; taking just pride in the fact that that class of trade with which we are identified, Hardware and its kindred lines, furnishes undisputed proof of the great value to commercial life

of a high standard of moral business integrity; among no other class of merchants is it more marked, among no other class of merchants are there so few failures and among no other class of trade can we find better men or more loyal citizens.

It is not necessary to go back more than 20 years, and selecting even a period when the country was enjoying commercial prosperity, if we examine carefully the unwritten code of business honor and compare it with that in vogue to-day, we shall know that the world, or at least the Hardware world, is growing better.

HARDWARE MANUFACTURERS

have found that goods must represent fair value if their prestige is to be maintained, and that they must deliver the same full measure of quality that they agreed to deliver when they made the sale; the Hardware merchants and the Hardware jobbers have found by long and bitter experience that the cheapest goods that they can buy are not the most satisfactory goods to sell, the consuming public have learned when they are buying an article for service and use that something besides price must be considered. Those distinguished veterans of the Hardware trade, the Simmons Hardware Company of St. Louis, have sounded the keynote in their talisman, "The recollection of quality remains long after the price is forgotten."

THE GREAT ORGANIZATIONS

of Hardware manufacturers, Hardware jobbers and retail Hardware merchants stand as a great power for good; by these organizations and because of them it has been possible to bring together the various branches of a common tree, for the injury of none, for the general good of all. It has broadened our merchants and manufacturers and enlarged their scope of vision, and paved the way to a mutual enjoyment of the great prosperity which we see on every hand.

ALL THESE FACTORS AND CONDITIONS,

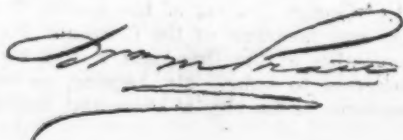
so entirely different from what were known in the nineties, eighties, seventies or sixties, conserving the vast energy of a progressive people, using it to the very best possible advantage, add momentum to the great crested wave upon which we are now being borne, until its power is well nigh irresistible. No minor happening can check its advances. Safeguarded by an export trade running into the billions it seems likely to continue just so long as the soil yields good harvests and labor is well employed.

WHEN WE TAKE OUR EYES

from the canvas of the present with all its brilliant hues, and face that sad picture following the panic of 1893 or the dull depression of the eighties, we wonder what has wrought the change. Resources, development, organization and system have each done their full share. Individually, great success would have not been possible, together their achievements astonish the world. The wonderful resources of our country developed to a full degree, controlled by practical organizations, engineered by economical systems, go to make up our greatest industrial mechanism.

This perfected machine needs the service of each individual part no matter how infinitesimal, to insure its well working and long life. The present time commercialism is a great machine. The conditions of the present prosperity depend upon its working. We are all of us individually a part in its make-up—let us each do our share.

Once more permit me to congratulate you upon the wonderful work you have been able to accomplish and upon the wonderful magazine you conduct. At the same time these congratulations are meant as well for every branch of the Hardware trade; its value to them cannot even be estimated. May its success long continue and its power largely grow.



THE EARLY AND THE LATER DAYS.

By J. R. Nutting, Davenport, Iowa.

IT will be difficult for a person of my tender years to write much of the history of the Hardware trade for so long a period as a half century. My grandfather could tell you that during that time they were still using Wrought Nails, and for a large portion of the period Common cut Iron Nails were in use and the Nail machines were fed by hand. He would also tell you that it was then and is yet the most practical and best kind of Nail we have ever had; that all Horse Nails and Horseshoes were made by hand; Plows were made of cast iron with a detachable point or shear which was supposed to endure in stony ground two or three days. In the rich black soil of Iowa these Plows would have been worthless. Hoes, Rakes, Forks, Scythes and Axes were still to some extent being made by hand; Pocket Knives, Table Knives and Forks, Planished Iron, Carvers, Steels, Trowels, Saws, Screws, Curry Combs, Stamped Tinware, Files, Padlocks, Chains, Tin and Terne Plates, Wire Nails and a thousand and one other articles were in part or altogether imported.

"L. S. AND D."

He could also have written that many goods were still billed in pounds, shillings and pence sterling, and that he probably never knew what "£ s. and d." really meant. Well, probably not all of your readers can remember now. It is generally believed that these initials are abbreviations of pounds, shillings and pence, but they are not. The "£" could not be an abbreviation of pounds; "S" might possibly stand for shilling; but "D" could have no rational connection with pence. In fact these initials are from the old Roman money in use before there was an English or sterling money. "£ s. and d." are abbreviations of libra, solidus and denarius; 12 denarii make 1 solidus, 20 solidi make 1 libra. These names for money were carried into France and thence into England, and from England the Roman libra came to America. The inevitable libra contracted into lb., which is still in general use in billing Hardware to-day. The word shilling is from skill and thing—small thing, simply meaning small change. Penny means pawn or pledge; farthing the fourth of a thing, or fourth part of a penny. The name sterling means purity or genuine. It is a contraction of the West German word Easterling, which means Eastern thing—money used in the East.

NEW YORK CITY HEADQUARTERS.

In the olden days if a manufacturer on either side of the Atlantic had anything to sell in this country it was sold to some New York City jobber or importer. If a country dealer, and every dealer outside of New York in those days was called a country dealer, wanted to buy anything he went to New York and bought it. Such houses as Hart, Bliven & Mead, Clark, Willson & Co. and many others did business with the largest and best wholesale and retail dealers in the country, and those houses were then considered exceedingly large establishments, but compared with some houses on the west side of the Mississippi now would look very much like three dimes added together.

Shelf goods were wrapped up in paper packages, which were untidy in appearance and inconvenient to handle and gave the shelves of the average Hardware store a slovenly look as if a cyclone had recently passed that way. The great bulk of Hardware found its way to the consumer through the general stores, now referred to as department houses.

SOME CHANGES NOT FOR THE BETTER.

All of the changes during the half century have not been improvements. Listing goods and selling subject to list and discount, sending salesmen to customers instead of customers going to market, distributing illustrated price-lists broadcast throughout the land, making prices on a quantity basis, entering advance orders with prices guaranteed, combinations, pools, trusts and large mergers, which now practically control many lines of staple and unstaple goods, are some of the changes that have not

been beneficial to the hardware trade. The time was when cost and selling prices were regarded sacred secrets in every well ordered store, but now they are printed in trade papers and magazines accessible to everybody.

DECIDED IMPROVEMENTS.

There are, however, many changes that have been decided improvements. Among them are a greater variety of quality, beauty and utility in the goods we sell. For example Builders' Hardware, then used as a necessity, has now become important in the finish and decorations of the home and other buildings; the Meat Chopper has taken the place of the Mincing Knife; Swift and Enterprise Coffee Mills of many sizes and capacity have superseded the old one size side-mill; Winslow and other beautiful, automatically fastened, metal polished Steel Skates have taken the place of the old fashioned wood bottom, string fastened, flat runner Skate that required as much room to turn as a stern-wheel steamboat; the Boring Machine, the old time back breaking Hand Auger, Mortising Machines against the old way; Washing and Wringing Machines in the place of the pounding barrel and washboard; Pott's smoothing and polishing instead of Sad Irons; Kitchen Utensils, Farmers' and Mechanics' Tools have also continued to improve.

In the store and warehouses the railroad side tracks, electric water and steam elevators are an improvement on the dray and old outside tackle blocks worked by hand power.

OTHER INNOVATIONS.

Since I can remember there was very little in the way of office appliances except a bottle of poor ink, a quill pen, foolscap writing paper, a day book and a ledger. Now we have telephones, stenographers, phonographs, addressographs, mimeographs, copying presses, adding machines, commercial credit reports and so on in more things than one can remember. Cash and short-time credits have succeeded the long-time and repeat credit system that has passed, we hope, beyond recall.

On the whole we have shorter hours, accomplish more, are happier, but we realize a much smaller percentage of profit in sales than we did in my grandfather's days.

J. R. Nutting

THE EARLY MANUFACTURE OF FILES.

By Paul E. Heller, Newark, N. J.

OUR business was started in 1839 in Newark, N. J., by Elias Heller, now deceased, and during these 67 years there have been radical changes, most of which have been for the benefit of the Hardware trade generally. At the beginning all Files and Rasps were made by hand from imported English steel, and very few were made in this country, the great bulk of the goods being imported from England, wrapped and tied in paper parcels and packed in crude casks.

GREAT PREJUDICE

existed against the domestic maker of goods and little, if any, progress was made to induce the dealers or jobbers, the latter being then principally importers, to take any interest in the American made goods. However, in the sixties and after the war some of the wideawake merchants stocked the American made goods in preference to the Sheffield Files and Rasps and at this time Elias G. Heller succeeded to his father's business and through strenuous efforts succeeded in getting the dealers and jobbers to stock Heller's goods in preference to the imported brands. The English goods, however, held the market until American manufacturers brought...

THEIR INVENTIVE GENIUS

to their aid and built machines to make Files and Rasps at least as good as the Sheffield makers were producing

them by hand. Machinery and the aid of the American tariff soon secured the American market for the American made Files and Rasps, and to-day it is impossible to find any of the English brands in this country and they are fast disappearing in Canada as well as being driven out of other foreign countries.

In 1880 we started the manufacture of our own steel, as well as a line of Farriers' Tools. At this time the old English methods of wrapping and tying Files and Rasps in paper packages and shipping them in crude casks and cases were done away with, and the neat cardboard boxes and wooden cases which contained a certain quantity of goods were introduced by the progressive manufacturer. Jobbers and retailers, who formerly anticipated their wants for six months or more at a time and allowed the manufacturer to make them to order, gradually forced the manufacturer to carry the stocks, so that at present jobbers and retailers only carry a month's supply and expect goods shipped from the factory on receipt of order.

CONQUERING FOREIGN MARKETS.

After the American manufacturers had thoroughly established their business throughout the United States and Canada they looked for foreign markets, so that now American Files and Rasps can be found in all civilized countries. Owing to the fact of the uniform superior quality, as well as the neat boxes and the manner of packing and last, but not least, the low cost of the goods, the large foreign buyers have been induced to place their orders for Files and Rasps in this country. The American manufacturers of Files, who can be counted on the fingers of one's hand, are now doing a much larger business than all the foreign makers combined and are fast monopolizing the markets of the world.

THE NATIONAL HARDWARE ASSOCIATION.

By T. James Fernley, Philadelphia.

ORGANIZATIONS among the Hardware trade of the country had been started in several sections previous to 1894 and were having considerable success. The Southern Hardware Jobbers' Association had been in the field for several years and it was generally recognized that the results accomplished amply compensated for the efforts put forth by the officers and members of that organization.

The New York State Hardware Jobbers' Association had been in the field several years and the members of that association were very enthusiastic concerning the benefits to be derived from organized effort.

The Mississippi and Missouri Valley Hardware Association was quite influential in the section of the country to which its sphere of usefulness was directed.

New England also had an association which was giving promise of being advantageous to the Hardware trade in that section of the country. In addition to these sectional associations quite a number of the leading cities of the country had Hardware associations. The merchants and manufacturers of Hardware in Philadelphia had formed an association in 1886 and this association at the time alluded to had a membership of about 100 firms and corporations.

The city of Pittsburgh had quite an active organization among the jobbing trade, as did the city of Cleveland. It was the latter association which was responsible for the

BRINGING INTO EXISTENCE

of the National Hardware Association of the United States. The Cleveland association extended an invitation to 126 Hardware jobbing houses scattered throughout the country to attend a conference in their city on December 13, 1894. Forty-eight firms and corporations were represented at the meeting which convened on that date. George Deming of the George Worthington Company was president of the Cleveland Hardware Jobbers' Association at the time, and it was he who called the conference to order. Mr. Deming, as well as all of his associates in the city of Cleveland, had very pronounced

views as to the possibility of the success of a trade organization covering the entire country.

It is quite a coincidence that at the hour of writing this article the body of this most estimable man is being consigned to the tomb, guardian angels having taken his soul to his Maker on December 24.

During the convention it very early developed that a national organization should be formed. William W. Supplee, president of the Supplee Hardware Company of Philadelphia, who was known either personally or by reputation by each one present, was made the temporary chairman of the conference and W. H. Coles of the McIntosh Hardware Corporation the secretary. A Committee on Permanent Organization was appointed and on December 14 their report was presented, the organization formed and a constitution and by-laws adopted. The Committee on Nominations nominated Mr. Supplee as president, H. H. Bishop of Cleveland first vice-president and John Alling of Chicago second vice-president.

Of the 48 firms present at the convention 26 signed the constitution and by-laws and became members of the organization. The Executive Committee was elected immediately after the formation of the association and among its duties was the appointment of the secretary-treasurer. The committee met in the city of Cleveland on February 21, 1895, and elected to that position the writer. It became his duty at once to endeavor to build up the membership of the organization so that the proper influence could be exerted upon those with whom we as an association were to come into contact.

The first annual meeting of the association was held in Pittsburgh, November 20 to 22, 1895. In commenting on the formation of the association the president said:

There probably was no more auspicious time during the last 16 years for the wholesale Hardware trade of the United States to have entered into united council than during the year 1894, when the suggestion was first made and soon after followed by the first meeting of the National Hardware Association in December, 1894.

We had passed through two years of exceptionally serious trade depression, which had tried the ability of the ablest managers and financiers of mercantile and manufacturing industries. Legitimate mercantile business had been crippled to such an extent that even to retain one's valuable force of experienced employees at former salaries was scarcely guaranteed from the profits of trade; indeed in many instances they were retained only through encroachment upon capital visible on the yearly balance sheets.

Trade conditions had also reduced the value of Hardware from 10 to 20 per cent. in one year; owing to these depressed conditions, coupled with the losses incidental thereto, and the reduction in the value of goods, an unusually large number of the retail Hardware trade were compelled to succumb, insolvent, leaving the wholesale merchant a legacy of their overdue accounts and unpaid notes. With the manufacturer the reduced price of goods had been reached at the expense of workmen, accompanied in many instances with the wiping out of their profits.

During the continuance of this uneven struggle the number of unemployed had reached gigantic figures, and that they included many in the Hardware trade is shown by the number of applicants for situations. Our own firm, by actual count, had 165 applications from salesmen during a period of six months. No account was kept of applicants for other positions.

It is therefore but natural that prices under these conditions became demoralized, and that many goods passed through the warehouse without adequate profit.

In the meantime some manufacturers who had hitherto been content in successfully marketing their goods through the legitimate channel of the jobber sought way stations and cross roads between cities of their heretofore trade, and unfortunately without familiarizing themselves with either the extra actual expense of marketing goods in far smaller quantities, or of the jobbers' actual expense in the disbursement of goods in the quantities that these smaller buyers would purchase, and so adopted a policy which, while not profitable to themselves, was destructive and demoralizing to legitimate trade. They ignored the fact that goods were worth no more going through the hands of the jobbers than they were going direct from the manufacturers, this being a fact that should be made known to all manufacturers, with the further fact that the cost of doing business can be no less with the manufacturer selling in minimum quantities than that of the jobber, who with a variety of stock can sell the same class of trade a maximum quantity, representing as his stock does a large number of manufacturers.

DEVELOPING THE ASSOCIATION.

In traveling throughout the country in our efforts to induce the jobbers to join the organization we met a very large number who were convinced that conditions could not be improved through an organized effort or in any other way. We were compelled to present arguments in many instances to all of the members of the firm or offi-

cers of the corporation approached, and while we were not successful in every instance we did feel at the end of the year somewhat gratified that we had succeeded in securing the membership of 112 of the 126 firms and corporations whose names we had the privilege of soliciting.

On November 18, 1896, our second annual convention met in Philadelphia. Our membership had increased during the year almost 50 per cent., the Membership Committee reporting 162 jobbing houses connected with the association. At this convention the subject of the influence of catalogue houses was first given attention. One of the members of the association called attention to the fact that a certain catalogue house in Chicago received the largest mail distributed to any house in that city.

METAL DEPARTMENT.

At this meeting it was decided to establish a metal department in connection with the association work, it having been ascertained that the members of our association in certain sections of the country dealt very largely in tin plate and metals; in other sections this line was separate and distinct from the regular Hardware business. Arrangements were made for the establishment of the separate department of our association, and it is very pleasant to record that to-day nearly all of the leading jobbers of metals are connected with the organization.

Our next annual convention was held in Buffalo, November 17, 18 and 19, 1897. The report shows that this convention was larger than either of its predecessors and that substantial progress had been made during the preceding year.

LOCAL ASSOCIATIONS.

Special effort had been made to form local associations of Hardware jobbers throughout the country and at this meeting reports were received from the officers of a large number of associations which had been formed through the instrumentality of the National Hardware Association. A letter was received from the National Hardware Association of Great Britain thanking our Association for the assistance rendered them in connection with the formation of their association.

The fourth annual convention of the association was held in Milwaukee, November 16, 17 and 18, 1898. William W. Supplee, who had been president of the association four years and through whose administration such rapid strides had been made, peremptorily refused to serve longer, expressing it as his opinion that it was the duty of others to continue the work. At the close of the convention H. H. Bishop, who had been first vice-president during Mr. Supplee's administration, was elected president.

In a report presented to this convention the statement was made that four years previous in many sections of the country bitter feeling existed between various jobbing houses and that even where this was not the case, competitors had scarcely a speaking acquaintance with each other, while at this time (1898) local associations had been formed in many sections and cities and there was a cordial feeling existing between the various jobbing houses.

THE POLICY OF THE ASSOCIATION

was given very free discussion and it was unanimously voted that no change be made in our plan of action—no price agreements had ever been made; each member of the association having a right to conduct his business untrammelled by any agreement entered into by the association. The manufacturers were given to understand that they were privileged to continue to sell the retail trade; all we asked was a differential in prices to cover the expense of distribution, which the manufacturers conceded was quite as great when they distributed their own goods as when the jobber did it for them.

The association again convened in Pittsburgh in 1899 (November 15, 16 and 17). Its strength had continued unabated and the report showed that an increased number of manufacturers had consulted the association in order to ascertain what selling policy would be most agreeable.

For the first time the Canadian Wholesale Hardware

Association was represented, which organization had been formed on January 10 of that year.

TWO PER CENT. CASH IN TEN DAYS.

About the middle of the year 1899 one or two very large combinations of manufacturers contended that the discount of 2 per cent. formerly given to those who anticipated payment should no longer be given and that the jobber should be forced to pay net cash in 30 days and the retail dealer should in turn be compelled to pay the jobber without receiving a premium for anticipated payment.

At this convention the work the association had done in combating this idea was very freely reviewed and a resolution was adopted reading as follows:

Resolved, That it is the sense of the National Hardware Association that the discount, 2 per cent. for cash in ten days, formerly given by the manufacturers of steel and iron goods, be not construed as back interest but as a premium for prompt payment and as an insurance of protection of credits, and, further, that such or similar discount be retained where still allowed, and that we urge its restoration where it has been discontinued.

Some very influential friends of the association on the outside advised us against pressing this proposition, stating that conditions had changed and that the time had arrived when the retail merchant must be compelled to pay strictly within 30 days.

We argued, as an association, that the retail merchant was not in a position to shorten his terms of payment and that in fact the retailer was giving a much longer term of credit than either the jobber or the manufacturer. It was not long after the 1899 convention before the manufacturers who had adopted net cash terms returned to the plan of 2 per cent. in 10 days, so that at this writing it is safe to say that the almost universal terms in connection with the sale of Hardware are 60 days, 2 per cent. off in 10 days.

At the close of the Pittsburgh convention John Bindley was elected president of the association and served the organization faithfully until August, 1901, when Richard W. Shapleigh, the first vice-president, became president of the organization by reason of the fact that Mr. Bindley's business engagements made it necessary for him to resign. Under Mr. Bindley's administration the organization had continued to prosper.

The sixth annual convention was held in Richmond, Va., November 21, 22 and 23, 1900. The reports of the committees indicated that the various departments of the association were being conducted along lines which were adding strength to the organization.

EFFORT TO CONSOLIDATE THE JOBBERS.

The seventh annual convention was held in Cleveland October 9, 10 and 11, 1901. The attendance, as usual, was large. The work during the latter part of the year and the early part of the subsequent year was extremely difficult. Manufacturers of many lines of goods had entered into combinations forming organizations with large capitalization, so that those who had been conducting an ordinary manufacturing plant and who were very little known outside of their own community had become men of national repute. They had ceased to wait on themselves and were attended by valets; the ordinary Pullman was not considered by them a proper means of conveyance. After these gentlemen had entered combinations private cars were ordered and yachts were built. It was but natural that the Hardware jobbers should feel constrained to participate in this era of organized prosperity.

From August, 1901, to May, 1902, strenuous efforts were made by a large number of prominent jobbers to form a combination which would practically control the jobbing Hardware business of the United States. Some of these gentlemen were active in association work and some were prominent jobbers who had never felt the need of an association.

At the Cleveland convention of our association R. A. Kirk of St. Paul was elected president, and in his hands was placed the destinies of the association. At this critical time the secretary-treasurer of the association, who was given an opportunity to aid in the formation of the proposed combination, chose to remain neutral on the subject. The result is well known, and while the project did not succeed, those who were promoting it must feel

some satisfaction in knowing that a movement of this magnitude was under way for nearly one year and that not one word has ever been uttered reflecting on the honor of those connected with it, and while, as we have stated, many of these were members of the National Hardware Association, through it all their loyalty to the organization never wavered, and they are still among its warm supporters.

MANUFACTURERS ORGANIZE.

At the time of the Cleveland convention the manufacturers of Hardware who had been attending our association meetings for years as visitors formed the American Hardware Manufacturers' Association, with the late Fayette R. Plumb as its first president. He was succeeded by J. C. Birge, who in turn has given way to F. S. Kretzinger. The relations between this organization and our own are of a very pleasing and cordial nature, and meeting as they do each year at the same time and place as our association our members have most excellent opportunity of meeting our manufacturing friends.

On October 19, 20 and 21, 1902, our convention was held in New Orleans. The attendance was large, many important subjects were discussed, and it was the consensus of opinion of all those in attendance that the convention was one of the most successful ever held. Mr. Kirk was re-elected president of the association and the following year was one of considerable prosperity.

The convention of 1903 was held on November 18, 19 and 20 at Atlantic City, N. J. Our association at this convention was particularly favored by having present delegates from the National Retail Hardware Association of the United States.

RELATIONS WITH RETAILERS.

On May 18, 19 and 20, 1903, a conference was held in Philadelphia between the executive committees of the National Retail Hardware Association and the National Hardware Association, the object of the conference being to consider what is now known as the catalogue house question. As a result of this conference the relations between the retailers and wholesalers of Hardware became more closely united.

At this convention questions relating to the interest of the retail merchant were given careful consideration and it was proven to the satisfaction of our retail friends that statements which had been made in the early days of our association to the effect that it was the purpose of the organization to make it more difficult for the retailer to exist were absolutely untrue, the retailer being convinced that for years this association had been working on lines which were in every particular of value and advantage to that branch of the trade.

At the close of the Atlantic City convention Samuel A. Bigelow was elected president of the organization. His work as the administrative officer of this association is fresh in the minds of the trade and it is not necessary at this time to dwell upon it.

CATALOGUE HOUSE COMMITTEE.

Early in the year 1904 aggressive measures were taken to counteract the evil influence of the mail order houses. Mr. Norvell of St. Louis was appointed chairman of the Catalogue House Committee.

In June of this year representatives of the National Retail Association, the Southern Hardware Jobbers' Association and this organization met in conference in St. Louis and organized the Wholesale and Retail Hardware Joint Committee, of which Mr. Norvell is now chairman; E. M. Bush, Evansville, Ind., vice chairman; M. L. Corey, Argos, Ind., secretary for the retail trade, the writer occupying the position of general secretary. The work of this committee is still fresh in the minds of the trade and need not be enlarged upon in this historical sketch.

The convention in 1904 was held in Atlantic City, representatives of the retail trade again being in attendance, and it was an extremely interesting meeting. Mr. Bigelow was re-elected president and served with great acceptability until the close of our Washington convention November 8, 9, and 10, 1905. It certainly afforded the president of the association great satisfaction on that occasion

to note that the membership was at high water mark, and that the attendance at the convention and the meetings was larger than on any previous occasion.

At the close of the Washington convention W. S. Wright of Omaha was elected president of the association, and its destinies during this year are in his hands. He has the confidence of all who know him, and there can be no doubt concerning the future of an organization whose interests are thus guarded.

DURING THE ELEVEN YEARS

covered by this sketch there have been frequent changes in the officary of the organization, the leading men in the Hardware business of the United States being on its Executive Committee, and it is to these men as well as the presidents and vice-presidents that the success of the organization is due. Only one of those occupying official positions in the association since its formation has been removed from this scene of activity. We allude to John Alling of Chicago, one who was respected, esteemed and honored by all those with whom he came into contact.

And now in closing we wish to congratulate *The Iron Age* on having completed 50 years of a useful existence and to hope that its wise and conservative policy may be continued, and that those who have a charge of that portion of the paper which relates to the Hardware trade will continue to be fair to retailer, manufacturer and jobber. We believe that the kind treatment accorded this association, both in the editorial and reportorial departments, has been very helpful to this organization.

A REMINISCENT TALK WITH LORING COES.

LORING COES of Worcester, Mass., dean of Hardware manufacturers, who at the age of 93 years is the active manager of the business which he founded in 1841, is better equipped by experience than most men to tell of the great changes that have taken place in business and manufacturing methods during the half century which has elapsed since *The Iron Age* was founded in 1855. Fifty years ago Mr. Coes had entered upon the prime of his life. His own principal business, the manufacture of Screw Wrenches, of which tool he was the original inventor, had been established and was prospering. He had seen the beginning of the tremendous industrial development which has ever since been accumulating in force. He knew the ways of the industrial and business world of the time.

THE GREATEST OF ALL THE ELEMENTS

which have entered into the growth and extension of manufacturing industries has been the development of machinery, he stated in a recent conversation with a representative of *The Iron Age*. Fifty years ago machinery was not altogether crude. Much that exists to-day is merely the result of the evolution of those old machines. Costs have been continually lowered with machine improvements, or added costs in other directions, such as labor, have been counteracted or counterbalanced. Methods have changed just as greatly, partly, though not wholly due to better mechanical equipment.

Mr. Coes himself started in the manufacture of Wrenches with machinery consisting of a punch, a Lathe for cutting Screws, a Power Drill and a Milling Machine of his own design. A neighbor had a metal Planer, a Hand Power Machine, and taking this as a basis Mr. Coes substituted a Milling Head for a Planer Head and had a Milling Machine. With this equipment and the hand work of his mechanics, the latter a far more important item in the manufacture of a Wrench than it is to-day, he produced 300 Wrenches a month. To-day the Coes Wrench Company turns out 3000 Wrenches a day. Other machinery was added later, including Trip Hammers, but hand labor continued to be an important factor in all lines of metal manufacturing until long after Mr. Coes began to read his copy of *The Iron Age* for the news of the market and the trade, and he was one of the earliest patrons of the paper.

The business had moved to south end of Worcester, near its present location, before 1855. Water power was employed, and here is another instance of the tremendous strides that have been taken in mechanical improvements.

AN OLD BREAST WHEEL WAS USED.

a rude enough medium of converting water into power when compared to the highly efficient water turbines of the twentieth century, which the company uses for a part of its power at the present time. The breast wheel's efficiency, reckoned in percentage of the full power developed, was exceedingly small. While there were so-called regulators they failed to satisfactorily perform their functions. The only way to stop the wheel was to shut the gate. The steam engines were equally wasteful. These costs, considered on the present day basis, seem high, but the water itself, the chief source of power, did not have the same intrinsic value that it possesses to-day.

THE ELEMENT OF LABOR

was very different than we of the present day know it. The workman counted for more, in one sense of the word, for he had to do a great many things which are now attended to by machinery. Processes were more involved. But half a century ago the most expert machinists—and there were plenty of real experts in those days—the kind of man who gets \$3.75 and \$4 to-day, were content to work for \$1.75 a day, and \$1.50 was considered first rate wages.

Labor was never troublesome. The labor union was unknown. Workmen made individual contracts with their employers, just as they do in the nonunion shop of nowadays. Strikes were not even heard of. A man got what he was worth to his employer, and there was no talk of a uniform wage scale. In one way of looking at it wages were not so much lower than at the present time, for expenses were lower, including rents, but, on the other hand, the workman and his family did not begin to have the same comforts and luxuries they have nowadays.

AS TO MATERIALS

the best iron of 50 years ago was mined in Massachusetts and was known as Berkshire iron, or more specifically as Salisbury iron. It was a charcoal iron, singularly free from impurities. The Government used much of it in the manufacture of Guns, and during the war great quantities were produced, the Government having all of it under contract. Mr. Coes stated that during this period, though he sometimes got a little of the Salisbury iron, a surplus after the Government had taken all it wished, he used a Troy (N. Y.) iron, which was also an excellent metal.

In later years it became unprofitable to mine this Massachusetts iron, one reason being that the forests about the mines were so completely cut away for the manufacture of charcoal that it became necessary to haul either the wood or the charcoal a dozen miles or more, which was necessarily a great expense. Iron cost more than it does to-day.

Wrenches were made of iron and case hardened, and steel was substituted only a few years ago. The Berkshire iron came in bars, which in the manufacture of Wrenches had to be worked down for the shank, leaving enough metal for the head, an expensive process as compared to the present day method of taking a bar of the requisite size for the shank and upsetting the metal for the head.

THE EARLY METHODS OF MARKETING GOODS

were quite different from those of 1905. When Mr. Coes began business his Wrenches were handled by Henry Miller, a prominent Worcester Hardware dealer of his day. Mr. Miller did no traveling, nor did he send out men after trade. Mr. Coes thinks that he depended largely upon circulars in soliciting custom. At any rate it was about as difficult to sell 300 Wrenches a month as it was to produce them. Prices were higher than now for Wrenches. A 12-inch Wrench sold for \$24 and 25 off per dozen. This same list price has been maintained by Mr. Coes through all the years since 1841, but the discounts have been increased of course with decreased costs.

A short time after Mr. Coes began business he left Mr. Miller, and his goods were handled by Ruggles, Nourse &

Mason, manufacturers of Agricultural Tools. This firm had one of its members on the road, calling on the jobbers and also on the retail trade, making a market for goods, and under this system the demand for Wrenches was increased and the business was enlarged correspondingly. After a while the New York jobbing firm of Clark, Wilson & Co. took the entire Coes product, which marked another gain in business.

THE FIRST COST SYSTEM

was a crude enough one. The cost of labor, material, rent, &c., were totaled to give the cost of a month's production of Wrenches, which was near enough, considering the simplicity of the line, and also, and very important, the large margin of profit which was then possible. Under present conditions of competition more exact methods of computing costs are needed. But 50 years ago to charge a trifle too much or a trifle too little did not affect matters much. The same difference between actual cost and estimates to-day might mean the wiping out of a profit or the loss of business from too high a bid.

BANKING RELATIONS.

The relations of the manufacturer and his bank were vastly different than those of to-day. Few business men carried a balance of any amount. They could not. When pay day approached few were in position to meet it with cash on hand or in bank. The custom was to go to the bank, make a note and draw against the loan. As men were paid by the month this was not so complicated a system as it would be under the present weekly pay roll.

THE NEW TOOL STEELS.

Of all the great and radical improvements in methods and machinery for manufacturing no one change has been greater than that of the new tool steels, said Mr. Coes. It is a wonderful, unexplainable fact that a cutting metal has been found which works satisfactorily only when it is given work which would ruin the best of ordinary tool steel. It has made possible the return to the milling machine in the manufacture of wrenches, to give one instance of the changes this discovery has wrought.

In the earlier days of manufacturing wrenches it was found that large grindstones, operated by ample power, were more economical than the old milling machines. Mr. Coes has just invented and patented a new continuous milling machine which has begun successful operation in his works and which will eliminate grindstones, saving the cost of the stones themselves, the large amount of power required to run them and the wages of the grinders, none of the three items being small.

In closing Mr. Coes again reverted to the fact that of all influences upon the progress of manufacture none has equaled that of machinery. And he pointed out the screw machine which has replaced the lathe for cutting wrench screws and the wood-forming machines which produce the handles, replacing the old hand lathes, as live examples to prove the truth of his words.

LOUISVILLE FIFTY YEARS AGO.

By William R. Belknap, Louisville, Ky.

THAT the new year commemorates the fiftieth anniversary of the establishment of *The Iron Age* must be a matter of no little interest to its many readers. A half century in American history is no insignificant portion of time. A man 50 years of age, when we were boys, was looked on as one whose hair should fall upon his shoulders and who should walk with a long staff. Of course this same fiftieth milestone or obelisk looks less formidable when we once pass it ourselves. There are few American institutions which have not changed within that time; few American cities which do not bear the marks of great growth and development very much within that period.

THE AGE OF IRON

has become the age of Steel and has dragged the whole country in the sweep of its progress. Old things have passed away; many things have become new, including

the modern Steel plant and furnaces. Fifty years ago, when the writer was a boy, whose Saturdays were put in at the paternal store as part of his necessary education, all of the Cast Steel that we used, for example, came from England. The long deal boxes, strapped down and fastened with hand made Wrought Nails, were as near burglar proof as the modern bank Safe, with all of its electric alarms. To open one of these called for the combined intelligence of carpenter and blacksmith, with plenty of muscle and the most approved Cold Chisels. And as to the tough old "deal" itself, which died but never surrendered, that was consigned to the dump rather than to attempt making kindling of it.

IN THOSE DAYS

Louisville had but one small railroad, which ran from here to Lexington. Later the connection with the North came through a railroad running to Seymour, and later still to Indianapolis. A line of 'busses crossed over to Jeffersonville on the ferry. Such a thing as bridging the great Ohio was beyond the dreams of our home engineers. It was left for Albert Fink, a highly educated German engineer, to show us how. Now we have three bridges in active operation.

The cotton bales designed for Northern markets came up the river on the tremendous steamboats, and more or less Hardware which was imported came by sailing vessels through New Orleans and up the river by the same regular steamboats. Coil Chain, Bright Chain, Butchers' Files and Rasps, hand made Horse Nails, &c., were the regular contributions of Germany and England to our shelves and bins. Portland, the lower part of our city, was the head of navigation in ordinary low water, so that these goods were drayed to the main business center on tandem drays, two mules or a mule in the shaft and a horse for a leader. A trade publication was unknown.

When *The Iron Age* put in an appearance it was looked on as a questionable venture. Where was the support to come from? And as to subscribing—well, that was an extravagance! Now we see three or four copies taken in one office just because the "other fellow" can't wait.

AN AGE OF ORGANIZATION.

Possibly as much change may be noted in the tendency to associate and assemble those of the same calling. The National Association, the Southern jobbers, all of the State retail associations, each bears testimony to growing confidence of man in his fellow men. Fifty years ago each merchant was suspicious of his competitor. He could believe no good of him. Ambushing and bushwhacking were the order of the day. Now there is more tolerance and trust, and a note of the old unqualified suspicion sounds like an echo out of mediæval times. This is better and as it should be. We have to thank *The Iron Age* for encouraging high standards. We still hope to see the time when speaking for the Hardware trade at large there shall not be a mean man in it.

Wm R. Belknap

THEN AND NOW.

By Louis Hoffman, Vicksburg, Miss.

I CONGRATULATE you on your fiftieth anniversary in business. Should I name all of the changes in the Hardware and Gun business during my time I could fill up your whole paper; but these changes are known to all Hardware merchants over 40 years in business. I started in business in 1857; at that time there was no 2 per cent. off for cash in ten days; goods were sold at six months' time, and when that time expired New York merchants were thankful to receive a note payable in six months in settlement, profits being large and times easy.

THE FIRST GOODS I BOUGHT

were sold to me by Geo. Seaver of the firm of Bruff Bros. & Seaver, and Schuyler, Hartley & Graham, 9 Maiden lane. For many years after the war I went to New York and bought my stock of Hardware personally, but there is no use of my going to New York at the present time, as

all leading firms have their representatives call on me and take their orders in my office.

The greatest change is in the Builders' Hardware line. In former years when a man wanted to build he came accompanied by his carpenter, and bought his Hardware. At the present time specifications are made out by the architect and the lowest bidder gets the job, but there seems to exist some kind of graft, as it requires the friendship of the architect to secure the approval of the goods.

FIFTY YEARS IN BUSINESS.

By Samuel E. Winslow, Worcester, Mass.

ICE skating has always been indulged in by the people of this country whenever ice was at hand on which to skate, and the Ice Skate business has increased regularly with the population. No fad nor passing fancy has regulated the development of this business.

Roller skating, however, has been more spasmodic. Its history is to the effect that there have been times of tremendous general and popular interest in roller skating through nearly all countries of the world. For a period of six years, ending in 1884, the roller skating enthusiasm ran very high in the United States. During the past 15 months it seems to have been revived, and there is every indication that there is now under way a general revival of roller skating in rinks.

In 1856 Seth C. and Samuel Winslow, brothers, began the manufacture of Ice Skates. The total output of Ice Skates in the first year of the business was 20 pairs. Samuel Winslow, the founder, lived to see his Ice Skate business developed to such an extent that his factory was able to turn out very easily per minute twice as many pairs of Skates as he had been able to make in his first year. In 1873 we began the manufacture of Roller Skates and have continued this industry without interruption since that time.

THE SAME ADVANCES

in mechanical processes and in the quality of materials have been made in our products as have characterized most other goods manufactured in the United States. In a word we have progressed, we have endeavored to keep pace with the times, and we have realized that in this country the requirements of to-day may be obsolete next year. We believe that our existence for 50 years has been due to the rigid enforcement of fundamental principles common to all honestly conducted enterprises and coupled thereto the desire for and positive establishment of what in these days is known to be the "up-to-the-minute" policy.

The coincidence of age, the feature of small beginning, the record of constant progress and enlargement and the somewhat unusual circumstance of the continuous management of the business by father and a son for 50 years, all features common to each of us, would appear to warrant the exchange of congratulations and the proposal of a toast of "long life and prosperity," each to the other, by *The Iron Age* and the Samuel Winslow Skate Mfg. Company.

HARDWARE PROGRESS IN FIFTY YEARS.

By Brace Hayden, San Francisco, Cal.

WE have been taught from youth that "Time and tide wait for no man," but omitting the saline portion of the aphorism the strength of the truism is sufficiently apparent to most men after reaching a certain age, but to be told that *The Iron Age* has reached the venerable half century mark does not altogether inspire one with that reverence usually conceded to the 50-year period in the strenuous arena of the Hardware calling. It is rather a striking evidence of refreshing maturity, for in turning over its pages week by week, instead of any exhibition of senile weakness we find varied proofs of increasing strength, and therefore if time does not wait for a journal any more than it does for a man, the implication of gathering infirmity with in-

creasing years which may be deduced from the adage is wholly inapplicable to such an alert and lively publication as *The Iron Age*. So with gathering strength as years lengthen we greet the medium through which trade events and information from all active business centers are carefully noted and brought home to us, and trade woes find expression—and perhaps many thoughtful readers—to the relief of numerous contributors.

FIFTY YEARS AGO.

Changes in the Hardware business have been so numerous and rapid that some features are perceptible from year to year. To look back ten years the changes in many lines of goods, in design, finish, improvement in quality, and in articles altogether new to the trade have been so numerous as to be surprising to any one who will stop to think over the matter, but when we take in a retrospect of half a century the changes in goods and methods and conditions prevailing in 1850 to 1855 and those of to-day amount to a complete revolution, and even of the comparatively few articles which then comprised the stocks of Hardware, there are scarcely any that I can call to mind but what have been improved upon or superseded by something better. The transformation has been complete, and with the old time goods so the old time methods have been relegated to the forgotten past. Fifty years or so ago the distribution of Hardware was confined principally to water transportation along the sea coast, through the lakes and rivers and by teams. Railroad transportation was in its infancy—Buffalo was possibly the largest wholesale center west of New York and with but a single track railroad (the New York Central) through the State—the Erie was being built—the Erie Canal and the lakes were the great highways to the West. The stocks of goods were largely of English and German make—Spear & Jackson, Butcher's and other makes of Saws, Files and Tools; Marple's Wooden Braces, with sets of straw colored Tools; English and German Chains, Peter Wright Anvils and solid box Vises, Griffin's Horse Nails, English Padlocks, with big Keys as an evidence of strength and security; English Japanned Trays and Candlesticks, &c. American manufacturers, like the railroads, were in their infancy of producing and struggling hard against adverse conditions to grow, for a 24 per cent. tariff was favorable to the foreign manufacturer and our gold went to support him instead of fostering our own enterprises, but Corbin's Locks of few patterns were seen upon our shelves, and Builders' Hardware of crude design and to a limited extent was being made, and with it we include the blunt pointed Screws and the metal head Gimlets as a necessary addendum. We had Cast Butts after a fashion, and Wrought Butts, too, that generally required a Cold Chisel to pry open.

WHEN GOODS WERE EASILY SOLD.

In those good old times there were no travelers needed to gather in the orders and get ahead of your competitor, no catalogues to picture the goods and help the buyer in making a choice, but the retailer himself visited the wholesaler two or three or more times a year, selecting from the meager assortment such goods as he needed and maybe squared up his old accounts. There was not so much cutting of prices either, but there was fully as much contentment with the profit as nowadays; 2 per cent. cash discount is comparatively a new innovation, as long credit was then the custom. Very slow progress was being made by our manufacturers up to the time of the impending Civil War, but the imminence of that event and the danger through it of becoming involved with foreign nations, upon whom we were depending for supplies of nearly every kind, including war material, rendered it obligatory upon us to make our own goods and depend upon ourselves for supplies, no matter what the cost. The result from this situation was a Protective Tariff and from that hour development of our natural and physical resources began. It was the manufacturers' opportunity and quickly they embraced it and have held to its advantage ever since. Labor found employment, new enterprises were begun, Iron industries commenced to grow, soon cheaper Rails appeared, railroad building was pushed, new necessities demanded newer Tools, and

from the dreadful condition of the life struggle of the Union for existence there has gradually developed this mighty nation, with its thousands of factories, mills and mines, giving work to millions of artisans, mechanics and laborers, turning out both raw material and finished product in infinite variety for all wants and conditions, not only for our own consumption but practically for the world at large.

GROWTH OF EXPORTS.

Strange as it may appear at first sight our exports of manufactures have grown tremendously under the protection of high tariff, which presumably should operate the other way and prevent our selling to other nations. Not only have our manufactures increased, but our domestic commerce has developed in like proportion, and now the whole country is so ramified by a network of railroads that there are comparatively few towns of any magnitude but what are reached directly or are in close proximity to one or more lines, and even the shore of the distant Pacific, which country in 1850 was just commencing to be talked about, and was practically an unknown region, is now reached by five trans-Continental lines and more coming. Yet with all these facilities for carrying the roads are frequently blocked by an excess of freight beyond the limit of their capacity to handle promptly. The changes also in coastwise and lake navigation have been equally great, for from the small steamer and vessels of the earlier period now immense carriers rivaling the ocean steamship in capacity are required to accommodate the traffic of this inland sea, and which is such a conspicuous and important factor in the great iron and steel industries of the country.

THE TELEGRAPH.

With the telegraph in its infancy, then but partially installed and not in common use, without telephone, stenographers, typewriters, catalogues or travelers, with but limited mail, banking and transportation facilities and with a sparse population to supply, it is quite easy to realize the primitive condition of the Hardware trade both in stock, methods and achievements half a century ago as compared with the extensive assortment of stock now requisite, the complex yet exact machinery of detail in all departments of purchase, sale, shipping and accounting, and the unbounded enterprise and ambition of the wholesale Hardware merchant of the present day.

THE MOVEMENT WESTWARD.

The great movement has been Westward, and now the great distributing centers of Chicago, St. Louis, Louisville, Milwaukee, St. Paul, Minneapolis, Omaha, Kansas City, New Orleans and even distant San Francisco, Los Angeles, Portland and Seattle, with intermediate cities covering the whole vast area of the country, with its numerous wholesale houses in every locality, are all vying with each other for their share—or a little more—of the trade, and presumably all adequately equipped both in merchandise and facilities to get that little more than their share.

Fifty years ago a three-story building, 75 x 150 feet, was considered a big establishment, ample for both wholesale and retail departments, and doing a large business; this will indicate approximately the room required for the stock that was considered necessary, but hundreds of articles that are carried now were unknown then.

GOODS NOT KNOWN FIFTY YEARS AGO.

For example, we had no Wire Nails, Barbed Wire, Wire Fencing or Poultry Netting; no Bessemer or Open Hearth Steel and its products—it was not known then; no Steel Rails or Structural Beams and Shapes, which have revolutionized the building of large structures; Cast Steel was mainly imported; there were no Baby Carriages, Go-carts, Sewing Machines, Freezers, Refrigerators, Enamelled Ware, Horseshoes, Lawn Mowers, Wringers, Food Choppers, Carpet Sweepers, Door Hangers, Iron Planes, Twist Drills, Drop Forgings, Pipe Wrenches, Pipe Cutters, Wrought Pipe, Pipe Fittings, Bicycles or Bicycle Sundries; no fixed Ammunition or Loaded Shells carried in stock and but few of these things if any made. There was a small assortment of

Axes and Hatchets, but no Double Bits or such finishes or patterns as now. Shovels and Spades confined to two grades; Steel Goods, Hose, Forks and Rakes a very limited assortment; Saws of English make in small assortment of Hand, Panel and Rip; a small stock of Hammers, Common Auger Bits, Ball Braces (no ratchet), Plumbs and Levels, Screw Drivers of ordinary pattern, but none of the patent tools in great variety of nowadays; a few Lanterns for candle or oil (no kerosene then); a few Screw and malleable S Wrenches; a limited line of slide and box Coffee Mills; a few Parallel Vises, Picks and Sledges in small assortment; Steam Fittings and Brass Goods were not carried in stock; Electrical Supplies were unknown, for electricity had not been developed commercially; there were no fine mechanics' tools, similar to those of Sawyer or Brown & Sharpe. We had Cutlery, both table and pocket, of English or German make, of few patterns; Guns were muzzle loading, English, German or Belgian, and for percussion caps—no hammerless or breech loaders; Pistols not carried in stock; there was no stock of what is now known as Sporting Goods; a few Shears, Scissors and Razors of English or German make (no safety); a small assortment of Fish Hooks; no Watches were then carried in stock; neither Rubber Packing, Oil Stoves, Chain Blocks or Portable Forges, Spring Butts or Door Checks. Builders' Hardware was confined to a limited assortment of the commonest articles and cheaper goods; there was no such general line of fine and serviceable goods as are now made in endless variety by Yale & Towne, Sargent & Co., Corbin and many other manufacturers of this class of products, and there are hundreds of articles unknown or not carried then but now of common sale which time and space do not permit, neither is it necessary to mention them, as sufficient enumeration has been made to show that the usual Hardware stocks of to-day are altogether different from that of 50 years ago and there is no end to the new goods that are constantly being brought out.

FUTURE GROWTH.

If the growth during the last 50 years has been so marvelous what will it be in the next half century? That this country is bound to increase in population and in approximate ratio to the past few decades is altogether probable. What is to prevent it? Its natural growth will yearly add immense numbers, while its unrivaled advantages will continue to induce immigration in vast throngs, and all must be fed, clothed and housed and all must find something to do. Under these conditions that the Hardware business will continue to grow and expand with the country's development we may not only reasonably expect but be quite sure of, but whether the development will be along the lines of present distribution, unrestricted as to territory, or whether confined to the comparatively limited areas naturally most accessible to the various wholesale centers is a problem that time alone can solve; and whether the many vexatious subjects that are now the "burning questions" of the hour will still continue to perplex and harass all classes of the trade is a riddle which evidently is not very near solution. But even if solved others will arise to embarrass the situation, for in the strife of active business, conducted as it is and naturally will be by able, energetic and ambitious men, whose dominating principle must be self interest, and rightly so, there can be no long period of easy sailing, but contention and friction must be expected as the result of widely diverse interests complicated by the unrestricted freedom in marketing the diversified stocks now considered necessary to carry and which there is every reason to believe will be still further increased. Cannot these contentions be in some way minimized and the unnecessary friction which is extravagant and wasteful of good results be in great measure allayed, and through whom or by what agency can it be accomplished?

A COMMISSION.

Is it not properly within the province of the several trade journals to use their influence in the advocacy of measures that will tend to remove or abate trade jealousies, disturbances and senseless competition, and which

of all these publications has greater circulation, is more widely read and consulted and which can exercise more potent influence in this direction than *The Iron Age*—an esteemed authority in our trade literature and which now wears the honored crown of half a century of useful life and in whose experience and ability lies the added certainty of future success? May it therefore be your privilege always materially to aid in harmonizing the difficulties and unraveling the tangled web of diverse interests that surround the distribution of Hardware and its allied products through the media of the three great factors of trade—the manufacturers, jobbers and retailers—so that this famous journal may continue to be received with cordial welcome and read with equal satisfaction by all your friends and supporters.

ANOTHER FIFTIETH ANNIVERSARY.

By N. A. Gladding, Indianapolis, Ind.

WE desire to extend herewith our heartiest congratulations on the fiftieth anniversary of the foundation of your paper. The great success of your journal speaks for itself and needs no encomiums from us, nevertheless we would not feel right if we did not join the general song of praise which will no doubt be wafted your way from thousands of advertisers, readers and friends, all of whom are your admirers. To be great is a grand thing, but to be the greatest of the great is certainly a satisfaction of which any one may well be proud, and we are of the opinion that it is admitted by all that *The Iron Age* stands at the head of all the trade papers in the world in its line.

We trust that it may not be presumptuous on our part to speak in this connection of the fact that on January 1 we ourselves will enter upon the fiftieth year of our existence, which we hope to celebrate in a fitting manner during the winter of 1906 and 1907. This business was established by E. C. Atkins in a very small way in 1857, and at that time, while only a young man of between 25 and 30 years, he had received a very thorough training in the Saw business under his father and uncle, who were the first manufacturers of Atkins' Saws in this country at Bristol, Conn.

We simply mention our own age to show that we have been able to keep in touch, to some extent at any rate, with the development of the manufacturing of this country during the period mentioned. The history of our own business is somewhat similar to that of thousands of other manufacturing concerns who have struggled up from a very small beginning and had their ups and downs and who are still pushing forward in the great industrial procession.

LONG YEARS OF STRUGGLE AND HARDSHIP.

When reading some of the articles or letters written to the Hardware trade papers by some of our good friends in the trade we have noticed their reference to the wonderful profits supposed to have been made by manufacturers, and one would think that it had been very easy sailing for the manufacturers in this country, but the writers have failed to call attention to the long years of struggle and hardship through which these manufacturers have passed, or to the fact that statistics show that something over 90 per cent. of the concerns which start in the manufacturing business fall by the way-side; consequently it seems to us that if the very small minority achieve some measure of success they should be congratulated rather than otherwise. It does not seem to us right that a very few immense corporations, who perhaps have many millions as surplus, should be held up as shining lights to prove the general success of all those who enter the manufacturing business. As stated before, where one concern has succeeded nine have not.

DISTRIBUTING GOODS.

It is not necessary for us to call attention to the wonderful progress and development of the various forms of manufacturing in this country, as that is known by all men who read, but some of the changes that have taken place in the methods of distributing goods are well worth

noting. Fifty years ago the man with the small shop making his Saws or his Knives or his Plowshares was in close touch with the consumer. In fact, with many of them the user of the goods was the very beginning and foundation of the business. After a while, through the advertising by personal contact of one consumer with another, wherein they told of the good qualities of an article made by Mr. So and So, the reputation of the goods grew apace, and ere long Mr. Merchant began to take them up and the man running the shop, with perhaps a half dozen or so helpers, found that he had to increase his capacity, and so from year to year his demand from the merchants grew larger and his personal contact with the consumer less and less. Later on was established the great middleman, the jobber, for the purpose of trying to take care of the varied wants of the retail merchant. The jobber was found to be a great convenience to the retailer, as the latter was able to buy from the jobbers' stocks in small lots almost everything he might be in need of, and the tremendous success attained by many wholesalers of iron and steel and other goods speaks for itself.

PRIVATE BRANDS.

During recent years some jobbing houses have attempted to assume the rights and prerogatives of the manufacturer by having goods manufactured under their own private brands without the name of the manufacturer being thereon, thus eliminating the manufacturer entirely from the mind of the consumer. If this plan was carried out to its ultimate conclusion and every jobber had nothing but his own private brands the manufacturer's plant would be worth nothing more than the intrinsic value of his real estate and the machinery. The good will of his business would be no factor whatever.

The tendency has been to go to the other extreme from that of the old days, when the consumer and the manufacturer were in close touch, and the more that one studies the situation to-day the more it appears that it is necessary for the manufacturer to fight to preserve his own identity.

From manufacturer to jobber, from jobber to dealer and from dealer to consumer it seems to us is the rational course for the distribution of goods, and we trust that the trade while steering its course along the sea of time will not get so far out of sight of land as to overlook this fact.

We trust that *The Iron Age* may celebrate many more anniversaries and always remain as it is now, at the head.

A SPAN OF FIFTY-SIX YEARS.

By H. W. Luetkemeyer, Cleveland, Ohio.

IN the early fifties, during the good olden times when business took care of itself, as the present young Hardwareman will have it, the English shilling and six pence predominated, the solvent moneyed institution was the exception and the wild cat banks and currency the rule, and the value of Hardware was largely measured by size and not by quality.

The latch and string monopolized largely over the country and in the cities the crude large sized either right or left hand Door Locks, gray cast Butts, right or left hand, and the celebrated blunt Screw were in vogue.

The Norfolk Thumb Latch, quite voluminous in size, and sheet iron case riveted to a piece of board with crude Bolt and lift Latch, size 4 x 8, and Key so large it had to be carried in the hand, constituted the store door Lock.

THE INTERIOR DEALERS

in those times pilgrimated to New York twice a year to buy their supplies from distinctly import houses. Only a few timid attempts at manufacture in this country were known at that time and their product came through the importer likewise.

During the sixties improvements began to appear, such as Reversible Butts, Door Locks, Gimlet Pointed Screws, &c., and the quantity value of Hardware receded into quality. All the Door Trimmings were beginning to be

made smaller and decidedly better. Up to that time Hardware was considered staple.

During the seventies improvements, variations, &c., in the Hardware line multiplied to such an extent that the old proverb, Hardware is staple, had to be abandoned.

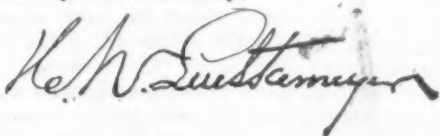
When first the Disston Saw came on the market it took quite a loose-tongued salesman to make the mechanic believe that the same was equal if not superior to the popular Spear & Jackson Saws, which were then almost the only good known saws on the market.

THE CUSTOM

of the Hardware business has so radically changed that the young people of the present day can hardly believe it. At present the jobbing Hardware trade is visited by the representatives of the manufacturer and coming East to procure goods has become superfluous. *The Iron Age* and like trade journals have been the means largely to bring the manufacturer to the notice of the dealers.

The present mode has revolutionized the good olden times when business was done from 7 o'clock in the morning until 10 o'clock at night. Business is now conducted comparatively speaking in a few short hours, has become very intricate and requires sharp alertness to keep in line with the existing keen competition.

America is now supreme as a producer and exporter of Hardware, Cutlery and Machinery.



A FORTY-EIGHT-YEAR PERIOD.

By Hon. D. H. Goodell, Antrim, N. H.

IF I am to write, according to your request, my recollections of Hardware manufacturing and of the Hardware trade for the last 48 years during which I have been in business, I fear I shall be charged with referring to myself more than is proper. I can, however, remember things that I have been personally connected with better than anything else, and that will be my only excuse.

TRAVELING SALESMEN AN EXPENSIVE LUXURY.

In 1857 there were very few, if any, Hardware merchants in this country who sent out drummers or traveling salesmen from their stores. I remember distinctly some of the largest concerns in the country refused, as they said, to employ men to travel about the country to peddle money in railway and stage fares and hotel expenses. They depended upon the customer to come into the city about twice a year and call at their stores to make their purchases.

The merchants were a little inclined to be quite independent with the customer, and it did really seem to some as though they felt that it was for the accommodation of the country trade that they kept their stock on hand rather than for their own profit and advantage.

ONE LARGE HOUSE.

which was supposed to be about the largest in the country at that time and had money to loan for manufacturing industries, &c., was among this class. A few years later when some of its enterprising neighbors who had been hustling about in the nearby towns and securing trade which the proprietors thought belonged to them had finally distanced them in the race, it fell by the wayside and was unable to pay its bills.

A new condition confronted the Hardware merchant, and in a short time it became an absolute necessity for him, if he would live and do business, to send out his drummers to the corners of the earth, and this course has been maintained by most jobbers until the present time.

COTTON CARDS.

The manufacturing house of Sargent & Co. established a store in New York City not far from this time for the sale of the goods manufactured by themselves. They

manufactured cotton cards. The business was so large and so successful that in the town of Washington, N. H., where the cardboards were made, it was said they kept a complete set of machinery outside of their cardboard factory to be ready for quick operation in case of fire destroying that which was working.

The Civil War caused a great demand for hand cotton cards in the South. In order that the merchants there might be sure of having a supply before a blockade was made they bought all they could secure. Sargent & Co. bought all the cotton cards that came into the City of New York manufactured by other people, and prices naturally advanced rapidly, until one day a large buyer came in and bought all the cotton cards Sargent & Co. had, paying them \$1500 in cash for the same. When the transaction was completed it is said that this buyer went to Geo. H. Sargent and suggested that he had charged him an exceedingly high price for these cards. Mr. Sargent, probably feeling somewhat satisfied with the trade, said at once in his pleasant way: "Don't bother me. You have hindered me now for 15 minutes. Why, these cards cost me \$300." This made a fast friend of this buyer, and I think he has been one of their fast friends ever since.

There were at that time quite a number of regular jobbing Hardware houses in the City of New York, but most of them have gone out of existence, and the hardware manufacturers have largely taken their places in that city.

SOLICITING TRADE THROUGH CATALOGUES.

Several years ago C. B. Rouss concluded that he would get his trade by writing letters and sending out circulars to the customer and asking him for his patronage and thus save the expense of traveling men. Success crowned his efforts and now several large houses are securing trade through their catalogues and sending out no drummers whatever, claiming, as they say, that the cost of the catalogues is not so great as the cost of traveling men, and consequently they are able to furnish to the retail customers throughout the country Hardware and almost all other kinds of ware at a less price than it can be obtained through what formerly had been called legitimate channels.

DEPARTMENT STORES AND CATALOGUE HOUSES.

During this time department stores have sprung up in nearly all cities and in some of the larger towns. A great fear was expressed by a large number of people for a long time lest this method of doing business would ruin the ordinary country dealers. Some of them have been obliged to go out of business and some have been absorbed in the department stores, and when competent men have been found they have been given the charge of certain departments with which they were familiar. This kind of trade has seemed to prosper so that now it seems to have become a settled method of distributing goods at retail in the near markets.

More recently retail stores have been established and some have been very successful in selling goods, distributing them to almost all parts of the country. These are called catalogue houses, though they do their business with the consumer in exactly the same way that the older catalogue houses have been doing their business with the retailer.

Much interest is attached to this comparatively new method of doing business. What the outcome will be nobody can tell, but one thing would seem to be certain and that is if by this method goods of equal quality can be distributed and received by the consumer at a less cost than by any other method of distribution the customer will demand this style of trade.

THE CHANGES IN MANUFACTURING

have been wonderful. Old methods have passed away and new methods have taken their places so that goods, which were formerly sold at list prices, are now sold at a profit with discounts so great that it would seem as though they would absorb all the original bill.

When we buy Screws, for instance, at 75, 10, 10 and 5, or perhaps with greater discounts, we are buying them almost the same as we buy Nails. The writer remembers

when he needed small Machine Screws it was almost impossible to secure them and it required every effort to obtain a sufficient number for our needs, and the prices were full list prices with no discounts whatever. Now these Screws can be bought for about 10 per cent. of the cost 40 years ago.

The inventive genius of the people has given us machinery that produces goods at almost no cost, as compared with what it was 40 or 50 years ago. What the future will bring us it is very difficult to tell, but the improvements seem to be going on as rapidly now as ever before.

HIS FIRST TRIP AS A SALESMAN.

I made my first general trip as a salesman in the spring of 1867. Previous to this time goods of our manufacture were sold by others. This first trip was a wonderful trip to me. I made the acquaintance of old customers as well as new ones. I saw wonderful sights and heard wonderful things. I was almost scared out of my wits when, arriving at East St. Louis, I was driven at a rapid rate down the stony road by the side of the river and rushed onto a big ferryboat and carried to the other side to ride up the steep and sidling banks to level ground. The ride on the river from St. Louis to Quincy was a revelation to me.

PROFANITY AND DRINK.

At Chicago I spent considerable time one day in one store. At night I remarked to one of the proprietors that I was glad to find one place where I could stay so long without hearing any profane language. The man was silent; but a year later a man employed by us called on this house and the man referred to this remark made by me the year before, when it came out that a minister of the gospel happened to be visiting there that day and that accounted for the better language that was used. In those days it was common for drummers to ask customers to drink with them. In some cases it almost appeared necessary to some drummers to do this if they would secure trade. I am glad to know that this custom has almost entirely disappeared and that the drummer who is sober under all circumstances is the successful salesman.

The great improvement of the moral standards of business men in this country is as apparent as the improvement on business lines. If it should continue for 50 years I am not sure but the millenium will have come. So may it be.

D. H. Goodell,

THE SOUTH FIFTY YEARS AGO.

By B. F. Eshleman, New Orleans, La.

IT is truly a happy privilege to one who has been a constant reader of *The Iron Age* for the past 50 years to extend his congratulations on this its Golden Anniversary. To compare the journal that was launched forth to the trade in 1855 with the 250-page production of to-day would be like comparing our country at about the same time with its present glorious position among the nations of the world. *The Iron Age* has always worked assiduously in the interest of the Hardware trade and has done much to educate men in the manufacture and sale of Iron, Steel, Hardware, Machinery, &c., to improve methods in distributing goods and to maintain business on a high plane of honor and integrity.

GOODS SOLD ON TWELVE MONTHS' TIME.

When we look back 50 years and recall the methods of doing business as compared with the present, we are lost in wonder and amazement. In the South we sold goods on 12 months' time, not all, but a good portion of the volume. This was necessary, as we were dependent on river transportation and navigation on streams tributary to the Mississippi River was open usually only three or four months in the year, hence farmers could not rely upon getting their crops to the market before fall or winter.

Long credits and large profits always go hand in hand, and there being no disposition to make an exception to the rule, about 50 per cent. profit was generally accepted as necessary to pay expenses and losses and provide a good living for the investor. The Northern States did not have such great difficulties in transportation to contend with, but when we consider that the great Pennsylvania system of to-day was then built only as far west as Pittsburgh it will be readily seen that they had difficulties also to surmount.

The present immense manufacturing establishment of Henry Disston & Sons was then a small shop in Philadelphia, in which you could find present the great founder himself working at the anvil. I well remember when I commenced my business career as an errand boy in a retail Hardware store in Lancaster, Pa., a visit from this same Henry Disston, "hale fellow well met," plain and honest, his own salesman, drumming the trade for orders in competition with goods of long standing reputation, such as Spear & Jackson.

At this time nearly all lines of Hardware, Cutlery and Guns were imported. The New England manufacturers, few in number, were in their infancy and could not compete with foreign goods. We all know now that they are exporting the same goods to the same people from whom they formerly bought in large quantities.

Forty Years Ago in Cleveland.

By George T. McIntosh, Cleveland, Ohio.

AS to changes I have noticed since I commenced the Hardware business I might almost say everything has changed. I remember very well the cold, blustering March day in 1867 when I started my career in the Hardware business with the W. Bingham Company of this city.

There were no power elevators used at that time, but all goods were hoisted and lowered by the old rope hand elevators, and when we wanted to go up stairs, which we did dozens of times each day, we simply walked. They employed only one porter and it was a part of new boys' business to pile Nails, work the elevator as well as sweep the store, take care of the fires, &c., but with all this to do I never heard of one of these boys being injured through overwork, and believe

SOME OF THE BEST HARDWARE MEN

of to-day are those trained in that manner. At that time we had two seasons for trade, spring and fall. We would begin to receive our spring stock in January and most of it would be in the house by March 1 when our spring sales would begin, the trade coming to the city to buy their goods. This rushing of business, receiving, selling and shipping into a few months made us very busy and all the help were expected to work nights as late as 10 p.m. and sometimes until midnight and past. This overwork seemed to be accepted as a matter of fact, and the boys worked with a will, without being asked by their employers to do so and many times without their knowledge.

Traveling salesmen were unknown and not employed by any of the Western jobbers at that time, and "we were in the West," for all merchants came to town twice each year, spring and fall. A few years later the firm decided to send some of the store salesmen out during the dull months, which followed the busy seasons. Some of these would go as far as Saginaw and Marquette, which were then in the far backwoods.

THE CHANGES IN GOODS

are quite as great or even greater than the methods of handling them. When I commenced a large share of our stock was made up of English and German goods, which we imported direct. Think of receiving a stock of Pocket and Table Cutlery, Padlocks, Curry Combs, Screws and all such goods packed in great enormous sugar casks! Think of having these goods all put up in paper packages instead of boxes! What a trick it was to be able to open these paper packages, put up in the peculiar English style, take out a few and rewrap them so that they

would look well. This was one of the first duties a boy was taught, and was the cause of much profanity on his part.

HENRY DISSTON'S FEAT.

About that time Henry Disston had just accomplished his surprising feat of driving the Spear & Jackson Saws out of the market, which, in my opinion, was the most marvelous deed ever accomplished in the world by any manufacturer. Since then Buck's Chisels and Rothery and other Files have replaced Butcher's celebrated goods; but these later manufacturers simply followed Henry Disston's example. To him, in my opinion, belongs the honor of being the first American manufacturer to dare to attack English goods. Spear & Jackson Saws were better known and had a much stronger hold on the market than Disston's have to-day.

I doubt if there was another man in the country at that time who would have had the courage to attempt such a work, but Mr. Disston started out with a few Saws under his arm and after he had visited the jobber and showed up his Saws in his original manner and talked in his very convincing way the case was settled, the verdict was in his favor and he would go away with an order for Saws in his pocket. His visit had so impressed the jobber and the jobber's salesman who met him that they were just as enthusiastic as Mr. Disston, and it only took a few years to drive the English goods out of the country.

Viewing the conditions as outlined above, is it not true, then, that everything has changed?

A TRIBUTE TO INSTRUCTORS.

And what about the men who did business in those days? I have always thought that I was fortunate in my early connections. The firm of William Bingham & Co., with whom I commenced, was composed of William Bingham, H. C. Blossom and two young men who had just been admitted, John E. Greene and Frank Thomas. All have passed to their reward except Mr. Greene. The senior members, Messrs. Bingham and Blossom, took a very active part in the business and were most excellent instructors. I am sure that if any of their employees have ever done an unbusinesslike or underhanded act it was not through their training.

A schooling under them for over seven years, from boyhood to manhood, and afterward a competitor of theirs in business for many years, placed me in a position to know them, and to know them as I did leads me to greatly respect their memories. Possibly many of our business men of to-day are their equals, but I am sure none are their superiors, for two more honorable men never lived. Long live their example!

SOME REFLECTIONS FROM A FORMER TRAVELER.

By William H. Maher.

I CONGRATULATE *The Iron Age* upon its fiftieth anniversary. It is, as times go, a long record to look back upon, and I am sure it will be conceded unanimously by every one who has followed its course that it is an honorable record for the management and a very helpful one for the trade whose teacher it has been.

My acquaintance with *The Iron Age* goes back to within five or six years of its birth, but it was not until I entered as a clerk in a Hardware store, 40 years ago this fall, that I began to really know it. I am free to say that for several years after that time I did not feel at all friendly to it, for it too often made me cut down my prices to meet its quotations.

I wondered then and I wonder now how any Hardware dealer could feel that he could afford to get along without it, and I was as willing to concede then as I am now that the man who read it was a better salesman, a better buyer and a better merchant than was to be met in the stores where the paper was not studied.

This, however, is only a well deserved introduction. *The Iron Age* is its own excuse for being, and at this late day needs no recommendation or advertisement.

FORTY YEARS AGO.

I have been looking back in my mind to trade conditions as they were 40 years ago and comparing them with

such conditions to-day, and as a whole I am surprised to see how little change there is in the business and the methods of business.

It is true that when *The Iron Age* was started and when I entered a Hardware store 75 per cent. or more of the goods in stock were of foreign manufacture, while to-day I doubt if 10 per cent. are European made. In a sense this is a tremendous change, but it took place so gradually and so easily that it left no mark anywhere.

It is also true a change has taken place in purchasing goods that is a revolution. Forty years ago every wholesaler and retailer went to headquarters to do the larger part of his buying and only sorted up when the traveling salesman called around, while to-day 75 per cent. of the trade do all their business with the traveling man. Yet this was such a natural thing to do under all the circumstances that it is hard to realize the change, and no one can point to the year or decade in which it took place.

DEAD AND FORGOTTEN.

It is true, and I mention it with a sad heart, that the men at the helm to-day are, except in rare cases, not the men who steered the business ships 40 or 50 years ago, but the passing away of a man here and a man there in this year or that year creates but very few ripples on the sea of trade. A woman in weeds lives on a few years to mourn his memory, while by the rest of the world he is soon forgotten. New men step into the shoes of the dead manager, and their personality is so pervading one never thinks of the one who worked so long and so hard to put the house on its solid foundation; so solid that even his loss did not cause a tremor to it.

Our old writing books used to have one favorite copy: Times Change and Men Change with Them. But to my thinking

HUMAN NATURE CHANGES VERY LITTLE;

it is very nearly the same yesterday and to-day and to-morrow. I used to be silenced when I complained at some certain customer having been passed without an order by the remark: "Things are a mighty sight different now from what they were when you were on the road." At last in self defense I was forced to see if that was true or not, and to my great satisfaction I found that human nature was exactly what it was 10 and 15 and 20 years before. The salesman needed the same knowledge of men, the same tact and the same thorough acquaintance with his business.

OTHER PEOPLE'S BUSINESS TOO ABSORBING.

I do not believe there is any new way discovered or going to be discovered by which men will make business any easier, will eliminate competition or will build up trade otherwise than by hard work, keeping down expenses, buying as low as possible and getting such profits as are fair and leaving the customer satisfied.

It seems to me the present day merchant is paying altogether too much attention to other people's business and too little to what he might do to increase his own. Conventions do some good in their way, but when they reduce themselves down to a boycott of some one or something for doing something they fancy aggrieves them they have reached the point where they are only amusing.

There has never been a year when we have not had real or fancied grievances. I remember a time when we would not buy a dollar's worth of goods from Sargent & Co. because that firm had men on the road selling to retailers. But Sargent went right along doing business and we gradually came to the conclusion that they did not interfere with us anyway.

OLD TIME TRAVELING MEN.

I sometimes start to say that as a whole the traveling men of to-day are of a higher grade than those of 30 or 40 years ago, but I stop myself. I commence to recall the company, if not regiment, of men I knew intimately in those old days, and then I am not willing to admit that their successors are one iota their superiors, if indeed they are their equals.

Forty years ago the traveling man frequently had to give an excuse for his own existence, and particularly so if he was calling upon the retail trade. It was assumed quite frequently that his expenses were added to the bill he sold, and consequently his coming was an

annoyance and expense. That feeling long since passed away, and the salesman to the retail trade is met with cordiality by 99 per cent. of his customers.

BUYERS THEN AND NOW.

With the wholesale house a man has come into the business who was not known 50 years ago, when *The Iron Age* issued its first number—this is the salaried clerk who is the buyer. Probably he will object to being called a "clerk."

In the old days, and, so far as this feature is concerned, in the "good old days," a member of the firm was the buyer, and he was approachable always, and almost always genial. He was never afraid that his dignity would suffer if he treated the representative of a reputable house in a cordial and friendly manner.

The latter day buyer hedges himself with such an unapproachable dignity that it is far easier to see J. P. Morgan than to get to his desk. Men sit in a row, like patrons of a barber shop, waiting to hear the call, "Next!" It is amusing to hear descriptions of the airs and assumptions of these buyers, but it is anything but amusing to the gentlemen who have to wait upon their sweet will. Most of these salesmen are paid double the salaries of the airy buyers, and often the men in waiting are heads of large concerns.

I have often wondered why the Hardware manufacturers did not deputize one of their number to attend the yearly meetings of the Hardware jobbers, to teach them the wisdom of treating traveling men with some small degree of consideration and of personally looking about occasionally and see if their buyer is really a shrewd man, or only a little stuffed rag baby.

ONE CANNOT RESIST

in such a retrospective review as this the luxury of saying a word about some of the old familiar names and faces, and yet where could one begin or where end? During the past 20 years I have had too frequent occasion to send a tribute of respect to the columns of *The Iron Age* for some good friend who had passed on before. They come back to me in memory now, and once more I meet them, with smiling faces and outstretched hands, and we sit down to compare notes of the days since last we met. They are legion! In every branch of the trade they had their place, and their individuality was forceful and prominent. Would that the dream were true, and they were here!

HARDWARE A GOOD BUSINESS.

But times and men change, and few are wearing the harness that wore it 40 years ago. New men are doing their predecessors' work, and one must admit that they are doing it well. The Hardware business was a good business then, and has been good ever since. It will continue to be a branch that will encourage young men to enter and will pay them well for their best efforts.

There is just as much room at the top as ever there was and plenty of comfortable places from the top clear down to the basement. And when, 50 years from now, the present editor shall request me to continue my observations, I believe I shall be able to sing the same song: "The Hardware business is a good business for men of brains." And *The Iron Age* has helped to make it so.

UNDERHILL, CLINCH & CO.

THE wholesale Hardware business of Underhill, Clinch & Co., 94-96 Chambers street, New York, has just been incorporated. The business, of which the present company is successor, was originally established a half century ago, in 1856. The company will as in the past continue to wholesale Hardware in the various branches, there being no change in the conduct of the business, the personnel of which remains the same. The directors are F. E. Underhill, A. D. Clinch and G. T. Adams, no action with regard to officers having yet been taken. This procedure is merely a formal one to provide for an uninterrupted continuation of the business in the event of death or disability of any interested parties. This popular and successful house will have the best wishes of a host of friends for its continued growth and prosperity.

DEATH OF H. C. WHITCHER.

H. C. WHITCHER, for many years a Hardware manufacturers' agent in Detroit, Mich., died suddenly from an attack of acute indigestion on December 21 while with relatives in Mount Vernon, Ohio. Mr. Whitcher was 56 years of age and had represented various manufacturers of Iron, Nails, Chain, &c., for the past 15 years. Previously he was connected with the W. Bingham Company of Cleveland, and had also been a member of the old Black Hardware Company of Detroit. He is survived by a son, William C. Whitcher of Cleveland, and a daughter, Mrs. D. S. Watson of Detroit.

PAINTS, OILS AND COLORS

Animal, Fish and Vegetable Oils—

Linseed, City, raw.....	40	@41
Linseed, City, Boiled.....	41	@42
Linseed, State and West'n, raw.....	39	@40
Linseed, raw Calcutta seed.....	42	@43
Lard, Extra Prime, Winter.....	66	@67
Lard, Extra No. 1.....	49	@50
Lard, No. 1.....	38	@40
Cotton-seed, Crude, f.o.b. mills.....	22	@23
Cotton-seed, Summer Yellow.....	29	@30
Cotton-seed, Summer Yellow, off grades.....	28	@29
Sperm, Crude.....	50	@52
Sperm, Natural Spring.....	48	@50
Sperm, Bleached Spring.....	49	@51
Sperm, Natural Winter.....	60	@62
Sperm, Bleached Winter.....	63	@65
Tallow, Prime.....	51	@53
Whale, Crude.....	42	@44
Whale, Natural Winter.....	42	@44
Whale, Bleached Winter.....	44	@46
Menhaden, Brown, Strained.....	23	@25
Menhaden, Light, Strained.....	24	@26
Menhaden, Bleached, Winter.....	30	@32
Menhaden, Ex-Bld., Winter.....	31	@33
Menhaden, Southern.....	16	@18
Cocconut, Ceylon.....	64	@66
Cocconut, Cochiti.....	8	@10
Cod, Domestic, Prime.....	34	@36
Cod, Newfoundland.....	33	@35
Red, Klaine.....	38	@40
Red, Saponified.....	41	@43
Olive, Italian, bbls.....	58	@60
Neatfoot, prime.....	48	@50
Palm, Logos.....	64	@66

Mineral Oils—

Black, 29 gravity, 25@30 cold test.....	10	@11
Black, 29 gravity, 15 cold test.....	11	@12
Black, Summer.....	10	@11
Cylinder, light filtered.....	18	@19
Cylinder, dark filtered.....	16	@17
Paraffine, 903-907 gravity.....	12	@13
Paraffine, 903 gravity.....	11	@12
Paraffine, 883 gravity.....	9	@10
Paraffine, Red.....	11	@12
In small lots 1/2¢ advance.		

Miscellaneous—

Barytes:		
White, Foreign.....	17	@18
Amer. floated.....	19	@20
Oil color, No. 2.....	13	@14
Chalk, in bulk.....	3	@4
Chalk, in bbls.....	10	@11
China Clay, English.....	11	@12
Cobalt, Oxide.....	2	@3
Whiting, Common.....	100	@101
Whiting, Gilders.....	100	@101
Whiting, Ex. Gilders.....	100	@101

Putty, Commercial—

In bladders.....	1.65	@1.85
In bbls. or tubs.....	1.15	@1.35
In 1 lb to 5 lb cans.....	2.60	@2.90
In 12 1/2 to 50 lb cans.....	1.45	@1.85

Spirits Turpentine—

In Oil bbls.....	68	@69
In machine bbls.....	68	@69

Glue—

Cabinet.....	11	@15
Common Bone.....	7	@9
Extra White.....	12	@14
Foot Stock, White.....	11	@14
Foot Stock, Brown.....	8	@11
German Hide.....	12	@14
French.....	10	@12
Irish.....	13	@16
Low Grade.....	9	@12
Medium White.....	14	@17

Gum Shellac—

Bleached Commercial.....	38	@39
Bone Dried.....	48	@49
Button.....	45	@46
Diamond.....	45	@46
Fine Orange.....	45	@47
A. C. Garnet.....	45	@47
D. C. Garnet.....	45	@47
Octagon B.....	42	@43
T. N.....	42	@43
V. S. O.....	42	@43

Colors in Oil—

Black, Lampblack.....	12	@14
Rhine, Chinese.....	36	@46
Blue, Prussian.....	32	@38

Blue, Ultramarine.....	13	@15
Brown, Vandyke.....	11	@14
Green, Chrome.....	10	@15
Green, Paris.....	10	@15
Sienna, Raw.....	12	@15
Sienna, Burnt.....	12	@15
Umber, Raw.....	11	@14
Umber, Burnt.....	11	@14

White Lead, Zinc, &c.—

Lead, English white, in Oil.....	8	@9
Lead, American white, in Oil.....	8	@9
Lots less than 500 lb. or over.....	7	@8
In Barrels.....	6	@7
Lead, White, in oil, 25 lb tin.....	1	@2
Lead, White, in oil, 15 lb tin.....	1	@2
Lead, White, in oil, 1 lb to 5 lb.....	1	@2
Lead, White, add to keg price.....	1	@2
Lead, American, Terms: For lots 12 tons and over 1/2¢ rebate; and 2¢ for cash if paid in 15 days from date of invoice; for lots of 500 lbs. and over 2¢ for cash if paid in 15 days from date of invoice, for lots of less than 500 lbs. net.....	1	@2

Lead, White, Dry, in bbls.....	6	@7
Zinc, American, dry.....	4	@5
Zinc, French:		
Paris, Red Seal, dry.....	9	@10
Paris, Green Seal, dry.....	9	@10
Antwerp, Red Seal, dry.....	9	@10
Antwerp, Green Seal, dry.....	9	@10
Zinc, V. M. French, in Poppy Oil:		
Lots of 1 ton and over.....	12	@13
Lots of less than 1 ton.....	13	@14
Zinc, V. M. French, in Poppy Oil:		
Red Seal:		
Lots of 1 ton and over.....	11	@12
Lots of less than 1 ton.....	12	@13
Discounts—French Zinc—Discounts to buyers of 10 bbl. lots of one or mixed grades: 1% 25 bbls., 2% 50 bbls., 4%.....		

Dry Colors—

Black, Carbon.....	5	@10
Black, Drop, American.....	4	@6
Black, Drop, English.....	5	@10
Black, Ivory.....	16	@20

Lamp, Com.....	4	@6
Blue, Celestial.....	1	@6
Blue, Chinese.....	2	@3
Blue, Prussian.....	27	@30
Blue, Ultramarine.....	4	@15
Brown, Spanish.....	1	@1
Carmino, No. 40.....	3	@3.60
Green, Chrome, ordinary.....	3	@6
Green, Chrome, pure.....	17	@25
Lead, Red, bbls., 25 bbls. and kegs:		
Lots 500 lb. or over.....	7	@8
Lots less than 500 lb. or over.....	7	@8
Litharge, American, bbls.....	7	@8
Ocher, American.....	1	@1.50
Ocher, American Golden.....	2	@3
Ocher, French.....	1	@1.50
Ocher, Foreign Golden.....	3	@4
Orange Mineral, English.....	10	@12
Orange Mineral, French.....	10	@12
Orange, Mineral, German.....	8	@10
Orange, Mineral, American.....	8	@10
Red, Indian, English.....	4	@6
Red, Indian, American.....	3	@4
Red, Turkey, English.....	4	@10
Red, Tuscan, English.....	7	@10
Red, Venetian, Amer.....	100	@1.50
Red Venetian, English, 100 lb.....	1.15	@1.75
Sienna, Italian, Burnt and.....		
Powdered.....	3	@4
Sienna, Ital., Raw, Powd.....	3	@4
Sienna, American, Raw.....	1	@2
Sienna, American, Burnt and.....		
Powdered.....	1	@2
Talc, French.....	10	@15
Talc, American.....	10	@15
Terra Alba, French.....	100	@1.00
Terra Alba, English.....	100	@1.00
Terra Alba, American.....	100	@1.00
Yellow, American.....	10	@15
Yellow, No. 1.....	10	@15
Yellow, No. 2.....	10	@15
Umber, T'key, Bnt. & Pow.....	2	@3
Umber, Turkey, Raw & Pow.....	2	@3
Umber, Burnt, Amer.....	1	@2
Umber, Raw, Amer.....	1	@2
Yellow Chrome.....	11	@14
Vermilion, American Lead.....	10	@25
Vermilion, Quicksilver, bulk.....	10	@25
Vermilion, Quicksilver, bags.....	10	@25
Vermilion, English, Import.....	7	@8
Vermilion, Chinese.....	10	@25

Current Hardware Prices.

General Goods.—In the following quotations General Goods—that is, those which are made by more than one manufacturer—are printed in *Italics*, and the prices named, unless otherwise stated, represent those current in the market as obtainable by the fair retail hardware trade, whether from manufacturers or jobbers. Very small orders and broken packages often command higher prices, while lower prices are frequently given to larger buyers.

Special Goods.—Quotations printed in the ordinary type (Roman) relate to goods of particular manufacturers, who are responsible for their correctness. They usually represent the prices to the small trade, lower prices being obtainable by the fair retail trade, from manufacturers or jobbers.

Range of Prices.—A range of prices is indicated by means of the symbol @. Thus 33 1/2, @ 33 1/2, & 10% signifies

that the price of the goods in question ranges from 33 1/2 per cent. discount to 33 1/2, and 10 per cent. discount.

Names of Manufacturers.—For the names and addresses of manufacturers see the advertising columns and also THE IRON AGE DIRECTORY, issued May, 1905, which gives a classified list of the products of our advertisers and thus serves as a DIRECTORY of the Iron, Hardware and Machinery trades.

Standard Lists.—A new edition of "Standard Hardware Lists" has been issued and contains the list prices of many leading goods.

Additions and Corrections.—The trade are requested to suggest any improvements with a view to rendering these quotations as correct and as useful as possible to Retail Hardware Merchants.

Adjusters, Blind—

Domestic, $\frac{1}{2}$ doz. \$3.00.....33 1/2%
North's.....10%
Zimmerman's—See Fasteners, Blind.

Window Stop—

Ives' Patent.....35%
Taplin's Perfection.....35%

Ammunition—See Caps, Cartridges, Shells, &c.

Anvils—American—

Eagle Anvils..... $\frac{1}{2}$ lb 6% @ 7¢
Hay-Budden, Wrought.....9¢ @ 9 1/2¢
Horseshoe brand, Wrought.....9¢ @ 9 1/2¢
Trenton..... $\frac{1}{2}$ lb 9¢ @ 9 1/2¢

Imported—

Peter Wright & Sons..... $\frac{1}{2}$ lb 10% @
Anvil, Vise and Drill—
Millers Falls Co., \$18.00.....15¢ @ 10%

Apple Parers—See Parers, Apple, &c.

Aprons, Blacksmiths'—
Livingston Nail Co.....33 1/2%

Augers and Bits—
Com. Double Spur.....75¢ @ 75¢ @ 5%
Jennings' Patn., reg. finish.....50¢ @ 60¢ @ 50%

Black Lip or Blued—
Boring Mach. Augers.....60¢ @ 10%
Car Bits, 12-in. twist.....50¢ @ 10%
Ford's Auger and Car Bits.....40¢ @ 5%
Forster Pat. Auger Bits.....25%
C. E. Jennings & Co.:
No. 10 ext. lip R. Jennings' list.....25%
No. 30, R. Jennings' list.....40¢ @ 7 1/2%

Russell Jennings.....25¢ @ 10¢ @ 5%
L'Hommedieu Car Bits.....15%
Mayhew's Countersink Bits.....45%
Millers Falls.....50¢ @ 60¢ @ 50%

Ohio Tool Co.'s Bailey Auger and Car Bits.....10¢ @ 10%
Pugh's Black.....20%
Pugh's Jennings' Pattern.....35%
Snell's Auger Bits.....60%
Snell's Bell Hangers Bits.....60%
Snell's Car Bits, 12-in. twist.....60¢ @ 10%
Wright's Jennings' Bits.....50%

Bit Stock Drills—
See Drills, Twist.

Expansive Bits—
Clark's small, \$15; large, \$25.....50¢ @ 10%
Clark's Pattern, No. 1, $\frac{1}{2}$ doz. \$25.....50%
No. 2, \$15.....50%
Ford's, Clark's Pattern.....60¢ @ 5%
C. E. Jennings & Co., Steer's Pat.....25%
Swan's.....60%

Gimlet Bits— Per gro.
Common Dble. Cut.....\$3.00 @ 3.25
German Pattern, Nos. 1 to 10,
\$1.60; 11 to 15, \$5.75

Hollow Augers—
Bonney Pat., per doz. \$5.50 @ 6.00
Ames.....25¢ @ 10%
Universal.....20%
Wood's Universal.....25%

Ship Augers and Bits—
Ship Augers.....\$5.65 @ 6.00%
Ford's.....33 1/2% @ 5%
C. E. Jennings & Co.:
L'Hommedieu's.....15%
Watrous.....35¢ @ 5%
Ohio Tool Co.'s.....40%
Snell's.....40%

Awl Hints—See Handies, Mechanics' Tool.

Awls—
Brad Awls:
Handled.....gro. \$2.75 @ 3.00
Unhanded, Shldered.....gro. \$2.75 @ 3.00
Unhanded, Patent.....gro. \$2.75 @ 3.00

Peg Awls:
Unhanded, Patent.....gro. \$1.75 @ 2.00
Unhanded, Shldered.....gro. \$1.75 @ 2.00

Scratch Awls:
Handled, Com.....gro. \$3.50 @ 4.00
Handled, Socket.....gro. \$11.50 @ 12.00
Hurwood.....40%

Awl and Tool Sets—See Sets, Awl and Tool.

Axes—
Single Bit, base weights:
First Quality.....\$6.75
Second Quality.....\$6.25
Double Bit, base weights:
First Quality.....\$9.00
Second Quality.....\$8.50

Axle Grease—See Grease, Axle

Axles—Iron or Steel
Concord, Loose Collar.....\$4.00 @ 4.50
Concord, Solid Collar.....\$4.00 @ 4.50

No. 1 Common, Loose.....3 1/4 @ 3 1/2¢
No. 1 1/2 Com., New Style.....3 1/4 @ 3 1/2¢
No. 2 Solid Collar.....4.00 @ 4.50

Half Patent:
Nos. 7, 8, 11 and 12.....75¢ @ 75¢ @ 5%
Nos. 13 to 14.....70¢ @ 75¢ @ 5%
Nos. 15 to 18.....75¢ @ 75¢ @ 10%
Nos. 19 to 22.....75¢ @ 75¢ @ 10%
Nos. 23 to 24.....75¢ @ 75¢ @ 10%

Boxes, Axle—
Common and Concord, not turned
lb. 1 1/4 @ 1 1/2¢
Common and Concord, turned,
lb. 5 1/4 @ 6¢
Half Patent.....lb. 8 1/4 @ 9¢

Bait— Fishing—
Hendryx:
A Bait.....20%
B Bait.....25%
Competitor Bait.....20¢ @ 5%

Balances— Sash—
Caldwell new list.....50%
Pullman.....50¢ @ 10¢ @ 60%

Spring—
Spring Balances.....50¢ @ 10¢ @ 60%
Chatillon's:
Light Spg. Balances.....40¢ @ 10%
Straight Balances.....40%
Circular Balances.....50%
Large Dial.....30%

Barb Wire—See Wire, Barb.

Bars— Crow—
Steel Crowbars, 10 to 40 lb.
per lb., 3 @ 3 1/4¢

Towel—
No. 10 Ideal, Nickel Plate.....gro. \$2.50

Beams, Scale—
Scale Beams.....40¢ @ 10¢ @ 50%
Chatillon's No. 1.....30%
Chatillon's No. 2.....40%

Beaters, Carpet—
Holt-Lyon Co.:
No. 12 Wire Coppered $\frac{1}{2}$ doz. \$0.85;
Tinned.....\$1.00
No. 11 Wire Coppered $\frac{1}{2}$ doz. \$1.10;
Tinned.....\$1.20
No. 10 Wire Galvanized.....\$1.75
Western W. G. Co.:
No. 1 Electric..... $\frac{1}{2}$ gro. \$7.80
No. 2 Buffalo..... $\frac{1}{2}$ gro. \$9.00
No. 3 Perfection Dust..... $\frac{1}{2}$ gro. \$2.00

Egg—
Holt-Lyon Co.:
Holt, No. A, Japanned..... $\frac{1}{2}$ doz. \$1.20
Holt, No. 1, Tinned..... $\frac{1}{2}$ doz. \$1.50
Holt, No. B, Japanned..... $\frac{1}{2}$ doz. \$2.00
Holt, No. 2, Tinned..... $\frac{1}{2}$ doz. \$2.25
Lyon, No. 2, Japanned..... $\frac{1}{2}$ doz. \$1.25
Lyon, No. 3, Japanned..... $\frac{1}{2}$ doz. \$1.50

Taplin Mfg. Co.:
No. 60 Improved Dover.....\$5.00
No. 75 Improved Dover.....\$6.50
No. 100 Improved Dover.....\$7.00
No. 102 Improved Dover, Tin'd.....\$8.50
No. 150 Improved Dover, Hotel.....\$15.00
No. 152 Imp'd Dover, Hotel, T'd.....\$17.00
No. 200 Imp'd Dover Tumbler.....\$8.50
No. 302 Imp'd Dover Tumbler, T'd.....\$9.50
No. 300 Imp'd Dover Mammoth..... $\frac{1}{2}$ doz. \$25.00
Western W. G. Co., Buffalo.....\$7.00
Wonder (H. M. W. Co.) $\frac{1}{2}$ gro. net, \$6.00

Bellows—
Blacksmith, Standard List.....
60¢ @ 10¢ @ 70¢ @ 10%

Hand—
Inch.....6 7 8 9 10
Doz.....\$4.75 5.70 6.65 7.60 8.55

Molders—
Inch.....9 10 11 12 14
Doz.....\$8.00 9.00 10.50 12.50 14.50

Bells— Cow—
Ordinary goods.....75¢ @ 75¢ @ 10%
High grade.....70¢ @ 10¢ @ 70¢ @ 10%
Jersey.....75¢ @ 10%
Texas Star.....50%

Door—
Abbe's Gong.....45%
Burton Gong.....50%
Home, R. & E. Mfg. Co.'s.....55¢ @ 10%
Lever and Pull, Sargent's.....60¢ @ 10%
Trip Gong.....50¢ @ 10¢ @ 50¢ @ 10%
Yankee Gong.....50%

Hand—
Hand Bells, Polished, Brass.....
60¢ @ 10¢ @ 60¢ @ 10%
White Metal.....40%
Nickel Plated.....50¢ @ 10¢ @ 50%
Rings.....60¢ @ 10¢ @ 70¢ @ 10%
Cone's Globe Hand Bells.....\$1.00 @ 35%
Silver Chime.....33 1/2%

Miscellaneous—

Farm Bells.....lb. 2 1/4¢
Steel Alloy Church and School
50¢ @ 10¢ @ 60%

American Tube & Stamping Co.
Gauges.....15%
Table Call Bells.....50¢ @ 50¢ @ 10%

Belting— Leather—
Extra Heavy, Short Lap.....60¢ @ 5%
Regular Short Lap.....60¢ @ 10%
Standard.....70%
Light Standard.....70¢ @ 5%
Cut Leather Lacing.....50¢ @ 5%
Leather Lacing Sides, per sq. ft.25¢

Rubber—
Agricultural (Low Grade).....
75¢ @ 75¢ @ 5%
Common Standard.....70¢ @ 70¢ @ 10%
Standard.....60¢ @ 60¢ @ 10%
Extra.....60¢ @ 60¢ @ 5%
High Grade.....50¢ @ 50¢ @ 10%

Bench Stops— See Stops, Bench

Benders and Upsetters, Tire—
Detroit Perfected Tire Bender.....40%
Detroit Standard Lightning Tire
Upsetters, No. 1, \$1.25; No. 2, \$7.25;
No. 3, \$10.50; No. 4, \$16.25; No. 5,
\$20.50.
Green River Tire Benders and Up-
setters.....20%

Bicycle Goods—
John S. Leng's Son's 1902 list:
Chain.....50%
Parts.....50%
Spokes.....50%
Tubes.....60%

Bits—
Auger, Gimlet, Bit Stock Drills,
&c.—See Augers and Bits.

Blocks— Tackle—
Common Wooden.....70¢ @ 10¢ @ 75%
Hartz St. Tackle Blocks.....50¢ @ 50¢ @ 5%
Hollow Steel Blocks, with Ford's
Patent Sheaves.....50¢ @ 10%
Lape's Patent Automatic Lock and
Junior.....30%
Stowell's Novelty, Mal. Iron.....50¢ @ 10%
Stowell's Self Loading.....60%
See also Machines, Hoisting.

Boards, Stove—
Zinc, Crystal, &c.....30¢ @ 19¢ @ 40¢ @ 10%

Boards, Wash— See Washboards.

Bobs, Plumb—
Keuffel & Esser Co.....33 1/2%

Bolts—
Carriage, Machine, &c.—
Common Carriage (cut thread):
3/4 x 6 and smaller.....75¢ @ 5%
Larger and Longer.....65¢ @ 50%
Phila. Eagle \$3.00 list May 24, '99.....80%

Bolt Ends, list Feb. 14, '95.....
65¢ @ 10¢ @ 75%
Machine, 3/4 x 1/2 and smaller.....
75¢ @ 5%
Machine, larger and longer.....
65¢ @ 50%
Door and Shutter.....
Cast Iron Barrel, Japanned,
Round Brass Knob:
Inch.....3 4 5 6 8
Per doz. \$0.30 .35 .45 .60 .80
Cast Iron Spring Foot, Jap'd:
Inch.....6 8 10
Per doz.....\$1.20 1.50 2.25
Cast Iron Chain, Flat, Japanned:
Inch.....6 8 10
Per doz.....\$1.00 1.40 1.85
Cast Iron Flat Shutter, Jap'd,
Brass Knobs:
Inch.....6 8 10
Per doz.....\$0.75 .95 1.25
Wrt Barrel Jap'd.....80¢ @ 80¢ @ 10%
Wrt "Bronzed.....50¢ @ 50¢ @ 10%
Wrt Spring.....70¢ @ 70¢ @ 10%
Wrt Shutter.....50¢ @ 50¢ @ 10%
Wrt Square Neck.....75¢ @ 75¢ @ 10%
Wrt Square 68 3/4 x 10¢ @ 68 3/4 x 10¢ @ 10%
Ives' Patent Door.....80%

Plow and Stove—
Plow.....65¢ @ 10¢ @ 70%
Stove.....87 1/2¢ @ 10¢ @ 70%

Tire—
Norway Iron.....80%
Norway Iron.....80%
American Screw Company:
Norway Phila., list Oct. 16, '84.....80%

Eagle Phila., list Oct. 16, '84.....82 1/2%
Bay State, list Dec. 23, '99.....80%
Franklin Moore Co.:
Norway Phila., list Oct. 16, '84.....80%
Eagle Phila., list Oct. 16, '84.....82 1/2%
Eclipse, list Dec. 23, '99.....80%
Mount Carmel Bolt Co.:
Norway Phila., list Oct. 16, '84.....80%
Eagle Phila., list Oct. 16, '84.....82 1/2%
Mount Carmel, list Dec. 23, '99.....80%
Russell, Burdall & Ward Bolt &
Nut Co.:
Empire, list Dec. 23, '99.....80%
Norway Phila., list Oct., '84.....80%
Upon Nut Co.:
Tire Bolts.....72 1/2%

Borers, Tap—
Borers Tap, Ring, with Handle:
Inch.....1 1/4 1 1/2 1 3/4 2
Per doz.....\$1.80 5.60 6.40 8.00
Inch.....2 1/4 2 1/2
Per doz.....\$5.65 11.50
Enterprise Mfg. Co., No. 1, \$1.25; No. 2,
\$1.65; No. 3, \$2.50 each.....25%

Boxes, Mitre—
C. E. Jennings & Co.....30%
Langdon.....15¢ @ 10%
Perfection.....40%
Seary.....33 1/2%

Braces—
Common Ball American.....\$1.25 @ 1.50
Barber's.....50¢ @ 10¢ @ 60¢ @ 10%
Fray's Genuine Spofford's.....60%
Fray's No. 70 to 120, 81 to 123, 207 to
414.....60%
C. E. Jennings & Co.....50¢ @ 5%
Mayhew's Hatchet.....60%
Mayhew's Quick Action Hay Pat.....50%
Millers Falls Drill Braces.....25¢ @ 10%
P. S. & W. Co., Peck's Pat.....60¢ @ 5%
Stanley R. & L. Co.:
Stanley.....35%
Victor.....45%

Brackets—
Wrought Steel.....80¢ @ 10¢ @ 80¢ @ 10%
Griffin's Folding Steel.....80¢ @ 10%
Griffin's Folding Brackets.....70¢ @ 10%
Stowell's Cast Shelf.....50%
Stowell's Sink.....50%
Western W. G. Co. Wire.....60¢ @ 10%

Bright Wire Goods— See Wire and Wire Goods.

Broilers—
Kilbourne Mfg. Co.....75¢ @ 20%
Western W. G. Co.....60%
Wire Goods Co.....70¢ @ 75¢ @ 10%

Buckets, Galvanized—
Price per dozen,
Quart.....19 12 11
Water, Regular.....1.40 1.70 1.90
Water, Heavy.....3.40 3.70 3.80
Fire, Rd. Bottom.....2.30 2.55 2.95
Well.....2.55 2.87 3.15

Bucks, Saw—
Hoosier..... $\frac{1}{2}$ gro. \$34.00

Bull Rings— See Rings, Bull

Butts— Brass—
Wrought, list, Sept., '96. 15¢ @ 10%
Cast Brass, Tiebout's.....50%

Cast Iron—
Fast Joint, Broad.....40¢ @ 10¢ @ 50%
Fast Joint, Narrow.....40¢ @ 10¢ @ 50%
Loose Joint.....70¢ @ 10¢ @ 75%
Loose Pin.....70¢ @ 10¢ @ 75%
Mayer's Hinges.....70¢ @ 70¢ @ 5%
Parliament Butts.....70¢ @ 70¢ @ 5%

Wrought Steel—
Table and Back Flaps.....75%
Narrow and Broad.....75%
Inside Blind.....75%
Loose Pin.....75%
Loose Pin, Jap'd.....70¢ @ 10%
Loose Pin, Ball and Steeple
Tip.....85%
Japanned Ball Tip Butts.....
70¢ @ 10%
Bronzed, Wrt., Nar. and In-
side Blind Butts.....55¢ @ 10%

Cages, Bird—
Hendryx, Brass:
3000, 5000, 1100 series.....5%
1200 series.....33 1/2%
200, 300, 600 and 900 series.....40¢ @ 10%
Hendryx, Bronze:
700, 900 series.....40¢ @ 10%
Hendryx, Enameled.....40¢ @ 10%

Calipers— See Compasses.

Calks, Toe and Heel—
Blunt, 1 prong.....per lb. 1.45¢ @ 1%
Sharp, 1 prong.....per lb. 1.45¢ @ 1%

Burke's Blunt.....	40¢	4¢
Burke's Sharp.....	40¢	4¢
Gautier, Blunt.....	40¢	4¢
Gautier, Sharp.....	40¢	4¢
Perkins, Blunt Toe.....	1 lb 3.65¢	
Perkins, Sharp Toe.....	1 lb 4.15¢	

Can Openers—

See Openers, Can.

Cans, Milk—

Illinois Pattern.....	5	8	10 gal.
New York Pattern.....	1.50	2.20	2.45 each.
Baltimore Pattern.....	1.50	2.20	2.45 each.
Dubuque.....	1.35	1.60	1.75 each.

Cans, Oil—

Buffalo Family Oil Cans:			
3	5	10 gal.	
\$18.00	60.00	129.60	gro., net.

Caps, Percussion—

Eley's E. B.....	52¢	55¢
G. D.....	per M	34¢
F. L.....	per M	40¢
G. E.....	per M	48¢
Musket.....	per M	62¢

Primers—

Berdan Primers, \$2 per M.....	80%
B. L. Caps (Sturtevant Shell).....	\$2 per M.....
All other primers per M.....	\$1.52@1.60

Cartridges—

Blank Cartridges:			
32 C. F.....	10¢	5¢	
38 C. F.....	10¢	5¢	
22 cal. Rim.....	10¢	5¢	
32 cal. Rim.....	10¢	5¢	
B. B. Caps, Con. Ball, Siegd.....	\$1.90		
B. B. Caps, Round Ball.....	\$1.49		
Central Fire.....	25%		
Target and Sporting Rifle.....	15¢		
Primed Shells and Bullets.....	15¢		
Rim Fire, Sporting.....	50%		
Rim Fire, Military.....	15¢		

Castors—

Bed.....	70¢	70¢	10%
Plate.....	60¢	10¢	60¢
Philadelphia.....	75¢	75¢	10%
Acme, Ball Bearing.....	70¢	10%	
Boss.....	70¢	10%	
Boss Anti-Friction.....	70¢	10%	
Gem (Roller Bearing).....	80%		
Martin's Patent (Phoenix).....	45%		
Standard Ball Bearing.....	45%		
Tucker's Patent low list.....	50%		
Yale (Double Wheel) low list.....	50%		

Cattle Leaders—

See Leaders, Cattle.

Chain, Coil—

American Coil, Straight Link:			
3-16 1/4 5-16 3/4 7-16 1/2 9-16			
\$8.60 5.80 4.85 4.10 3.95 3.85 3.80			
3/8 3/4 1 1 1 1 1 1 1 1/4 inch.			
\$3.75 3.60 3.55 3.70			
German Coil.....	60¢	10¢	10¢

Halter—

Halter Chains.....	60¢	5¢	60¢
German Pattern Halter Chains,			
list July 21, '97.....	60¢	10¢	10%
Covert Mfg. Co.....	35¢	5¢	
Halter.....	35¢	5¢	
Covert's Saddlery Works.....	70%		

Cow Ties—

See Halters and Ties.

Trace, Wagon, &c.—

Traces, Western Standard: 100 pr.			
6 1/2-6 3/4, Str'ght, with ring.....	\$24.50		
6 1/2-6 3/4, Str'ght, with ring.....	\$25.50		
6 1/2-8 1/4, Str'ght, with ring.....	\$29.50		
6 1/2-10 1/4, Str'ght, with ring.....	\$34.00		

NOTE—Add 2c per pair for Hooks.

Twist Traces 2c per pair higher than

Straight Link.

Eastern Standard Traces, Wag-

on Chain, &c..... 60¢10%

Miscellaneous—

Jack Chain, list July 10, '93:			
Iron.....	60¢	10¢	60¢
Brass.....	60¢	10¢	60¢
Safety Chain.....	75¢	75¢	10%
Gal. Pump Chain.....	1 lb 4¢	4¢	
Covert Mfg. Co.....	35¢	5¢	
Breast.....	35¢	5¢	
Heel.....	35¢	5¢	
Rein.....	35¢	5¢	
Stallion.....	35¢	5¢	
Covert Sad. Works.....	70%		
Hold Back.....	70%		
Rein.....	70%		
Oneida Community:			
Am. Dog Leads and Kennel Chains.....	40¢	40¢	5%
Niagara Dog Leads and Kennel Chains.....	45¢	60¢	5%
Wine Goods Co.....	70¢	10%	
Dog Chain.....	70¢	10%	
Universal Dbl.-Jointed Chain.....	50%		

Chain and Ribbon, Sash—

Oneida Community:			
Copper Chain.....	60¢	5%	
Steel Chain.....	60%		
Pullman:			
Bronze Chain.....	60%		
Steel Chain.....	60¢	10%	
Sash Chain Attachments, per set.....	100		
Aluminum Sash Ribbon, per 100			
ft.....	\$1.25@3.00		
Sash Ribbon Attachments, per set.....	8¢		

Chalk—(From Jobbers.)

Carpenters' Blue.....	gro. 38¢	40¢
Carpenters' Red.....	gro. 33¢	35¢
Carpenters' White.....	gro. 28¢	30¢

See also Crayons.

Checks, Door—

Bardsley's.....	45%	
Eclipse.....	60%	
Pullman, per gro.....	\$4.00	
Russwin.....	60%	

Chests, Tool—

American Tool Chest Co.:			
Boy's Chests, with Tools.....	55%		
Youth's Chests, with Tools.....	40%		
Gentlemen's Chests, with Tools.....	30%		
Farmers', Carpenters', etc., Chests			
with Tools.....	20%		

Machinists' and Pipe Fitters'			
Chests, Empty.....	50%		
Tool Cabinets.....	50%		
C. E. Jennings & Co.'s Machinists'			
Tool Chests.....	33¢	10%	

Chisels—**Socket Framing and Firmer**

Standard List.....	75¢	75¢	10%
Buck Bros.....	30%		
Charles Buck.....	30%		
C. E. Jennings & Co. Socket Firmer			
C. No. 10.....	60%		
C. E. Jennings & Co. Socket Fram-			
ing No. 15.....	60%		
Ohio Tool Co.'s.....	70%		
Swan's.....	75%		
L. & I. J. White.....	30¢	30¢	5%
L. & I. J. White, Tanged.....	25¢	5%	

Tanged—

Tanged Firmers.....	33 1/3¢	40%	
Buck Bros.....	30%		
Charles Buck.....	30%		
C. E. Jennings & Co. Nos. 191, 181, 25¢			

Cold—

Cold Chisels, good quality.....	13¢	15¢
Cold Chisels, fair quality.....	11¢	12¢
Cold Chisels, ordinary.....	9¢	10¢

Chucks—

Almond Drill Chucks.....	35%		
Almond Turret Six-Tool Chuck.....	35%		
Beach Pat., each \$8.00.....	35¢		
Empire.....	25%		
Blacksmiths'.....	35%		
Jacobs' Drill Chucks.....	35%		
Pratt's Positive Drive.....	25%		
Skinner Patent Chucks:			
Independent Lathe Chucks.....	50%		
Universal.....	50%		
Combination.....	30%		
Drill Chucks, Standard.....	45%		
Drill Chuck, Skinner Pat., all sizes.....	35%		
Drill Chucks, Positive Drive.....	30%		
Planer Chucks.....	25%		
Face Plate Jaws.....	40%		
Standard Tool Co.:			
Improved Drill Chuck.....	45%		
Union Mfg. Co.:			
Combination.....	50%		
Czar Drill.....	35%		
Combination Geared Scroll.....	40%		
Geared Scroll.....	50%		
Independent.....	40%		
Independent Steel.....	40%		
Union Drill.....	45%		
Universal.....	50%		
Independent Iron F. Plate Jaws.....	40%		
Independent Steel F. Plate Jaws.....	40%		
Westcott Patent Chucks:			
Lathe Chucks.....	50%		
Little Giant Auxiliary Drill.....	50%		
Little Giant Double Grip Drill.....	50%		
Little Giant Drill, Improved.....	50%		
Oneida Drill.....	50%		
Scroll Combination Lathe.....	50%		

Clamps—

Adjustable, Hammers.....	20¢	20¢	5%
Cabinet, Sargent's.....	50¢	10%	
Carriage Makers', P. S. & W.....	40¢	10¢	50%
Carriage Makers', Sargent's.....	30%		
Besly, Parallel.....	33¢	10%	
Lineman's, Utica Drop Forge & Tool			
Co.....	40%		
Saw Clamps, see Vises, Saw Filers.....	40¢	10%	
Wood Workers, Hammers.....	40¢	10%	

Cleaners, Drain—

Iwan's Champion, Adjustable.....	55%		
Iwan's Champion, Stationary.....	45%		

Sidewalk—

Star Socket, All Steel.....	\$4.05	net
Star Shank, All Steel.....	\$3.24	net
W. & C. Shank, All Steel.....	\$3.00	doz.,
7 1/2 in., \$3.00; 8 in., \$3.25.		

Cleavers, Butchers'—

Foster Bros.....	30%		
New Haven Edge Tool Co.'s.....	45%		
Fayette R. Plumb.....	33¢	33¢	10%
L. & I. J. White.....	30%		

Clippers, Horse and**Sheep—**

Chicago Flexible Shaft Company:			
'98 Chicago Horse, each.....	\$8.75		
1902 Chicago Horse, each.....	\$10.75		
20th Century Horse, each.....	\$5.00		
Lightning Belt Horse, each.....	\$15.00		
Chicago Belt Horse, each.....	\$20.00		
Stewart's Enclosed Gear			
Horse, each.....	\$6.75		
Stewart's Patent Sheep Shear-			
ing Machine, each.....	\$12.75		

Clips, Axle—

Regular Styles, list July 1, '05.80%

Cloth and Netting, Wire

—See Wire, &c.

Cocks, Brass—**Hardware list:**

Compression, Plain Ribbs,			
Globe, Kerosene, Racking,			
&c., Cocks.....	75¢	75¢	5%

Coffee Mills—

See Mills, Coffee.

Collars, Dog—

Nickel Chain, Walter B. Stevens &			
Son's list.....	40%		
Leather, Walter B. Stevens & Son's			
list.....	40%		

Combs, Curry—

Metal Stamping Co..... 40%

Mane and Tail—

Covert's Saddlery Works..... 60¢10%

Compasses, Dividers, &c.

Ordinary Goods.....	75¢	5¢	10%
Dividers:			
Bemis & Call Hdw. & Tool Co.:			
Calipers, Double.....	65%		
Calipers, Inside or Outside.....	65%		
Calipers, Wing.....	60%		
Compasses.....	50%		
Wm. Schollhorn Co.:			
Excelsior Dividers.....	60%		
Lodi Dividers.....	75%		

Conductor Pipe—

L. C. L. to Dealers:

Territory: Galvanized			
Galv. Charcoal			
Steel			
Iron			
Copper			

Eastern:

70¢12 1/2% 60¢10% 50%

Central:

70¢5% 60¢2 1/4% 40¢10¢5%

Southern:			
65¢12 1/2% 50¢15% 40¢12 1/2%			
So. Western			
60¢15% 50¢7% 40¢10%			

Copper.

Eastern..... 50¢10%

Central..... 50¢12 1/2%

Southern..... 50¢12 1/2%

So. Western..... 50¢12 1/2%

Terms, 60 days; 2% cash 10 days. Fac-

tory shipments generally delivered.

See also Eave Troughs.

Coolers, Water—

Gal, each.....	2	3	4	6	8
Labrador.....	\$1.20	\$1.50	\$1.80	\$2.10	\$2.70
Gal.....	2	3	4	6	8
Iceland, ea.....	\$1.80	\$2.10	\$2.40	\$3.00	\$3.60
Gal.....	2	3	4	6	8
Galvanized, ea.....	\$1.85	\$2.00	\$2.25	\$2.90	\$3.90
Galvanized, Lined, side handles,					
Gal.....	2	3	4	6	8
Each.....	\$1.95	\$2.15	\$2.40	\$3.30	\$1.15
White Enamelled.....	25%				
Agate Lined.....	25%				

Coopers' Tools—

See Tools, Coopers'.

Coppers' Soldering—

Soldering Coppers, 3 lbs. to pair

and heavier, 23¢2¢; lighter

than 3 lbs. to pair..... 25¢26¢

Cord—Sash—

Braided, Drab..... 1b. 35¢

Braided, White, Com., Nos. 8

to 12, 2¢; No. 7, 2 1/4¢; No. 6,

2 1/2¢.

Cable Laid Italian—

1b., A, 18¢; B, 16¢

Common India..... 1b. 10¢10 1/2¢

Cotton Sash Cord, Twisted..... 17¢19¢

1/4 Keys....lb. 5 1/2¢ 6 ¢ 4 ¢
 10-lb. cans....6 1/2¢ 7 ¢ 6 ¢
 10 in case....6 1/2¢ 7 ¢ 6 ¢
 10-lb. cans, less
 than 10.....10 ¢ 10 ¢ 8 ¢
 Less quantity...10 ¢ 10 ¢ 8 ¢
 NOTE.—In lots 1 to 3 tons a discount
 of 10% is given.

Extractors, Lemon Juice

—See Squeezers, Lemon.

Fasteners, Blind—

Zimmerman's.....50&10%
 Walling's.....40&10%

Cord and Weight—40%

Faucets—

Cork Lined.....50&50&10%
 Metallic Key, Leather Lined.....

Red Cedar.....40&10@50%
 Petroleum.....70&10@75%

B. & L. B. Co.:
 Metal Key.....60&10%
 Star.....60%
 West Lock.....50&10%

John Sommer's Peerless Tin Key.....40%
 John Sommer's Boss Tin Key.....50%
 John Sommer's Victor Mtl. Key.....50&10%
 John Sommer's Duplex Metal Key.....60%
 John Sommer's Diamond Lock.....40%
 John Sommer's I. X. L. Cork Lined.....50%
 John Sommer's Reliable Cork Lined.....50&10%

John Sommer's Chicago Cork Lined.....50%
 John Sommer's O. K. Cork Lined.....50%
 John Sommer's No Brand, Cedar.....50%
 John Sommer's Perfection, Cedar.....40%

McKenna, Brass:
 Burglar Proof, N. P.....25%
 Improved, 1/4 and 1/2 inch.....25%

Self Measuring:
 Enterprise, 1/2 doz. \$36.00.....40&10%
 Lane's, 1/2 doz. \$36.00.....40&10%
 National Measuring, 1/2 doz. \$36.00.....40&10%

Felloe Plates—

See Plates, Felloe.

Files—Domestic—

List revised Nov. 1, 1899.

Best Brands.....70&10@75&5%
 Standard Brands.....75&10@75&10%
 Lower Grade.....75&10@80&10%

Imported—

Stubs' Tapers, Stubs' Hat, July
 2d, '97.....33 1-3@40%

Fixtures, Fire Door—

Richards Mfg. Co.:
 Universal, No. 103.....\$3.75
 Special, No. 104.....\$3.75
 Fusible Links, No. 96.....50%
 Expansion Bolts, No. 107.....60&10%

Grindstone—

Net Prices:
 Inch.....15 17 19 21
 Per doz.....\$3.25 3.75 4.25 4.75
 P. S. & W. Co.....30&10@40%
 Reading Hardware Co.....60%
 Saw Co's.....70%
 Stowell's Giant Grindstone Hanger.....
 Heavy.....1/2 doz. \$6.00
 Stowell's Grindstone Fixtures, Extra
 Heavy.....50&10@10%
 Stowell's Grindstone Fixtures, Light.....60&10%

Fodder Squeezers—

See Compressors.

Forks—

NOTE.—Manufacturers are
 selling from the list of September
 1, 1904, but many jobbers are still
 using list of August 1, 1899, or
 selling at net prices.

Iowa Dig-Ezy Potato.....60&10%
 Victor, Manure.....60&15&25%
 Victor, Header.....60%
 Victor, Header.....60%
 Champion, Hay.....60&10%
 Champion, Header.....60%
 Champion, Manure.....60&15&25%
 Columbia, Hay.....60&10%
 Columbia, Manure.....60&10%
 Columbia, Spading.....70&12%
 Hawkeye Wood Barley.....40%
 W. & C. Potato Digger.....60&10%
 Acme Hay.....60&20%
 Acme Manure, 4 tine.....60&10&5%
 Dakota Header.....60&20%
 Jackson Steel Barley.....60&20%
 Kansas Header.....60%
 W. & C. Favorite Wood Barley.....40%
 Plated.—See Spoons.

Frames—Saw—

White, 8'x7' Bar, per doz. 75¢@80¢
 Red, 8'x7' Bar, per doz. \$1.00@1.25
 Red, 8'x7' Bar, per doz. \$1.40@1.50

Freezers, Ice Cream—

Qt.1 2 3 4 6
 Each.....\$1.30 \$1.60 \$1.90 \$2.20 \$2.50

Fruit and Jelly Presses—

See Presses, Fruit and Jelly.

Fry Pans—See Pans, Fry.

Fuse—Per 1000 Feet.

Hemp.....\$2.75
 Cotton.....3.20
 Waterproof Sgl. Taped.....3.65
 Waterproof Dbl. Taped.....4.40
 Waterproof Tpl. Taped.....5.15

Gates, Molasses and Oil—

Stebbins' Pattern.....80&10%

Gauges—

Marking, Mortise, &c. 50&10@60%
 Chapin-Stephens Co.:
 Marking, Mortise, &c. 50&10@50&10&10%
 Scholl's Patent.....50&10@50&10&10%
 Door Hangers.....50&50&10%
 Stanley R. & L. Co.'s Butt and
 Rabbit Gauge.....35%
 Marking and Mortise.....60%
 Wire, Brown & Sharpe's.....25%
 Wire, Morse's.....25%
 Wire, P. S. & W. Co.....30%

Gimlets—Single Cut—

Numbered assort-
 ments, per gro.

Nail, Metal, No. 1, \$2.00; 2, \$2.30

Spike, Metal, No. 1, \$4.00; 2, \$4.30

Nail, Wood Handled, No. 1,
 \$2.30; 2, \$2.60

Spike, Wood Handled, No. 1,
 \$4.30; 2, \$4.60

Glass, American Window

See Trade Keopt.

Glasses, Level—

Chapin-Stephens Co.....60&60&10&10%

Glue, Liquid Fish—

Bottles or Cans, with Brush.....

International Glue Co. (Martin's).....40%

Grease, Axle—

Common Grade.....gro. \$4.50@6.00
 Dixon's Everlasting, 10-lb pails, ea. 85¢
 Dixon's Everlasting in boxes, 1/2 doz.
 1 lb. \$1.20; 2 lb. \$2.50

Grips, Nipple—

Perfect Nipple Grips.....40&10&2%

Griddles, Soapstone—

Pike Mfg. Co.....33 1/3@33 1/3&10%

Grindstones—

Bicycle Emery Grinder.....\$6.50
 Bicycle Grindstones, each.....\$2.50@3.00
 Pike Mfg. Co.:
 Improved Family Grindstones,
 per inch, 1/2 doz.....\$2.00 }
 Pike Mower and Tool Grinder,
 each.....\$6.00 }
 Vellox Roll Bearing, Mounted, Angle
 Iron Frames, each.....\$3.00

Halters and Ties—

Cow Ties.....60&10@60&10&5%
 Covert Mfg. Co.:
 Web.....35&5%
 Jute Rope.....50%
 Sisal Rope.....45%
 Cotton Rope.....45%
 Hemp Rope.....45%
 Covert's Saddlery Works:
 Web and Leather Halters.....70%
 Jute and Manila Rope Halters.....70%
 Sisal Rope Halters.....60&20%
 Jute, Manila and Cotton Rope
 Ties.....70%
 Sisal Rope Ties.....60&10%
 Oneida Community:
 Am. Coil and Halters.....40&40&5%
 Am. Cow Ties.....45&50%
 Niagara Coil and Halters.....45&50&5%
 Niagara Cow Ties.....45&50&10&5%
 E. T. Rugg & Co.:
 Leather Halters.....50%
 Web Halters and Webbing.....60%
 Jute and Sisal Rope Halters.....60%
 Jute and Sisal Horse and Cattle
 Ties.....60%
 Cotton Horse Ties.....60%
 Livery Ties, Braided.....60%

Hammers—

Handled Hammers—

Heller's Machinists.....40&10@40&10%
 Heller's Farriers.....40&10@40&10%
 Magnetic Tack, Nos. 1, 2, 3, \$1.25
 No. 1, \$1.75
 Peck, Stow & Wilcox, Steel.....50%
 Fayette R. Plumb:
 Plumb, A. E. Nail.....33 1/3@7 1/2@33 1/3&10&7 1/2%
 Engineers' and B. S. Hand.....50&7 1/2@50&10&7 1/2%
 Machinists' Hammers.....50&50&10&5%
 Riveting and Tinners.....40&2 1/2@40&10&2 1/2%
 Sargent's C. S. New List.....40%

Heavy Hammers and

Sledges—
 Under 5 lb., per lb. 50¢ 80¢@—%
 5 to 5 lb., per lb. 40¢ 80¢@—%
 Over 5 lb., per lb. 30¢

Wilkinson's Smith's.....lb. 9 1/2@10¢

Handles—

Agricultural Tool Handles

Axe, Pick, &c.....60&10@60&10&5%
 Hoe, Rake, &c.....45@50%
 Fork, Shovel, Spade, &c.:
 Long Handles.....45@50%
 D Handles.....50@50&5%

Cross-Cut Saw Handles—

Atkins.....40%
 Champion.....45@45&10%
 Dixon's.....60%
 Pilot Hinges.....60%
 Rider Wooster.....65%
 Western Pattern.....70%
 Taylor & Boggis Fy Co's Kid-
 der's Roller Bearing.....50&15&10&5%
 Wilcox Mfg. Co.:
 Bike Roller Bearing.....1/2 doz. \$6.00
 C. J. Roller Bearing.....60&10%
 Cycle Ball Bearing.....50%
 Dwarf Ball Bearing.....40%
 Ives Wood Track.....60&10%
 L. T. Roller Bearing.....60&10&5%
 New Era Roller Bearing.....50&10%
 O. K. Roller Bearing.....60&10&5%
 Prindle Wood Track.....60%
 Richards' Wood Track.....60%
 Richards' Steel Track.....50&10%
 Spencer Roller Bearing.....60&10%
 Tandem Nos. 1 and 2.....60%
 Underwriters' Roller Bearing.....40%
 Velvet.....50%
 Wilcox Auditorium Ball B'r's.....20%
 Wilcox Barn Trolley No. 123.....40%
 Wilcox Elev. Door, Nos. 112
 and 122.....50%
 Wilcox Elev. Door.....40%
 Wilcox Fire Trolley, Roller
 Bearing.....30%
 Wilcox Le Roy Noiseless Ball
 Bearing.....40%
 Wilcox New Century.....50&10&10%
 Wilcox O. K. Steel Track.....50%
 Wilcox O. K. Trolley.....50%
 Wilcox Trolley B'v Bearing.....40%
 Wilcox Wideman Narrow Gauge
 Ball Bearing.....40%
 For Track, see Rail.

Mechanics' Tool Handles—

Auger, assorted.....gro. \$2.50@3.00
 Brad Axl.....gro. \$1.65@1.75

Chisel Handles:

Apple Tanged Firmer, gro.
 assorted.....\$2.40@2.65
 Hickory Tanged Firmer, gro.
 assorted.....\$2.15@2.40
 Apple Socket Firmer, gro.
 assorted.....\$1.75@1.95
 Hickory Socket Firmer, gro.
 assorted.....\$1.45@1.60
 Hickory Socket Framing, gro.
 assorted.....\$1.60@1.75
 File, assorted.....gro. \$1.50@1.75
 Hammer, Hatchet, &c.....60&10@60&10&5%

Hand Saw, Varnished, doz.

80¢@85¢; Not Varnished, doz.
 65¢@75¢

Plane Handles:

Jack, doz. 30¢; Jack, Bolted, 75¢
 Fore, doz. 45¢; Fore, Bolted, 90¢
 Chapin-Stephens Co.:
 Carving Tool.....40&20&10%
 Chisel.....65@65&10%
 File and Awl.....65@65&10%
 Saw and Plane.....40&40&10%
 Screw Driver.....40&40&10%
 Millers Fall Adj. and Hatchet Amer.
 Handles.....15&10%
 Nicholson Simplicity File Handle.....
 1/2 doz. \$0.85@1.50

Hangers—

NOTE.—Barn Door Hangers are gen-
 erally quoted per pair, without track,
 and Parlor Door Hangers per double set
 with track, &c.

Allis Mfg. Co.:
 Reliable, No. 1.....per doz. \$8.00
 Reliable, No. 2.....per doz. \$9.00

Chicago Spring Butt Co.:

Friction.....25%
 Oscillating.....25%
 Big Twin.....25%
 Chisholm & Moore Mfg. Co.:
 Baggage Car Door.....50%
 Elevator.....30%
 Railroad.....50%
 Cronk & Carrier Mfg. Co.:
 Loose Axle.....60&10%
 Roller Bearing.....70%
 Griffin Mfg. Co.:
 Solid Axle, No. 10, \$12.00.....70%
 Roller Bearing, No. 11, \$15.00.....70%
 Roller Bearing, Ex. Hy. No.
 22, \$18.00.....70%
 Hinged Hangers, \$16.00.....60&10%

Lane Bros. Co.:
 Parlor, Ball Bearing.....\$4.00
 Parlor, Standard.....\$3.15
 Parlor, No. 105.....\$2.55
 Parlor, New Model.....\$2.80
 Parlor, New Champion.....\$2.25
 Barn Door, Standard.....60&5%
 Hinged.....net \$6.40
 Covered.....60&2%
 Special.....70&5%

Lawrence Bros.:
 Advance.....60&10%
 Cleveland.....75%
 Clipper, No. 75.....60%
 Crown.....60&10%
 Easy Parlor Door, Dbl. Sets,
 \$2.50; Single Sets, \$1.25.....60&5%
 Giant.....70&5%
 Hummer.....70&5%
 New York.....60&10%
 Peerless.....75%
 Sterling.....60&10%

McKinney Mfg. Co.:
 No. 1 Special, \$15.....60&10%
 No. 2 Standard, \$18.....60&10%
 Hinged Hangers, \$16.....50%
 Meyers' Stayon Hangers.....60&5%
 Richards Mfg. Co.:
 Pioneer Wood Track No. 3, \$2.00
 Ball B'r's St'l Track No. 10, \$0.10
 Roller B'r's St'l Track No. 12, \$2.15
 Roller B'r's St'l Track No. 13, \$2.30
 Hero, Adj. Track No. 19, \$0.50
 Adjustable Track Tandem Trol-
 ley Track No. 16.....50&10%
 Seal, Steel Track No. 8.....\$2.25
 Auto Adj. Track No. 22, \$0.50
 Trolley B. D. No. 17.....\$1.25
 Trolley F. D. No. 120.....\$2.10
 Trolley F. D. No. 121.....\$2.25
 Trolley F. D. No. 150.....\$2.35
 Safety Underwriters F. D. No.
 101.....50%
 Tandem No. 41, 2 1/2 and 3 60&10%
 Palace, Adjustable Track No.
 1.....50&10%
 Royal, Adjustable Track No.
 122.....50&10%
 Ives' Wood Track No. 1.....\$2.00
 Trolley B. D. No. 20.....50&10%
 Trolley B. D. No. 24.....\$1.30
 Trolley B. D. No. 27.....\$1.40
 Trolley B. D. No. 28.....\$1.60
 Roller Bearings Nos. 39, 41,
 43.....60%
 Anti-friction No. 42.....60&20%
 Hinged Tandem No. 48.....60&5%
 Folding Door B. B. Swivel No.
 135.....40%

Safety Door Hanger Co.:
 Storm King Safety.....60%
 U. S. Standard Hinge.....60%
 Stowell Mfg. & Foundry Co.:
 Acme Parlor Ball Bearing.....40%
 Ajax Hinge Door.....60%
 Apex Parlor Door.....50&10&5%
 Atlas.....60%
 Baggage Car Door.....50&10%
 Climax Anti-Friction.....50&10%
 Elevator.....40%
 Express.....50%
 Freight Car Door.....60%
 Interstate.....60&10%
 Landy Parlor Door.....50&10%
 Magic.....60%
 Matchless.....60&10%
 Nansen.....70&5%
 Parlor Door.....50&10%
 Railroad.....50&10%
 Rex Hinge Door.....60%
 Street Car Door.....50%
 Steel, Nos. 300, 401, 500.....50&10%
 Underwriters' Fire Door.....40%
 Wild West Warehouse Door.....50%
 Zenith for Wood Track.....50&10%

A. L. Sweet Iron Works:
 Check Back.....70%
 Climax Anti-Friction.....50&10%
 Eagle.....70%
 Hylø Hinge.....70%
 New Perfection.....60%
 Pilot Hinges.....60%
 Dixon's.....60%
 Rider Wooster.....65%
 Western Pattern.....70%
 Taylor & Boggis Fy Co's Kid-
 der's Roller Bearing.....50&15&10&5%
 Wilcox Mfg. Co.:
 Bike Roller Bearing.....1/2 doz. \$6.00
 C. J. Roller Bearing.....60&10%
 Cycle Ball Bearing.....50%
 Dwarf Ball Bearing.....40%
 Ives Wood Track.....60&10%
 L. T. Roller Bearing.....60&10&5%
 New Era Roller Bearing.....50&10%
 O. K. Roller Bearing.....60&10&5%
 Prindle Wood Track.....60%
 Richards' Wood Track.....60%
 Richards' Steel Track.....50&10%
 Spencer Roller Bearing.....60&10%
 Tandem Nos. 1 and 2.....60%
 Underwriters' Roller Bearing.....40%
 Velvet.....50%
 Wilcox Auditorium Ball B'r's.....20%
 Wilcox Barn Trolley No. 123.....40%
 Wilcox Elev. Door, Nos. 112
 and 122.....50%
 Wilcox Elev. Door.....40%
 Wilcox Fire Trolley, Roller
 Bearing.....30%
 Wilcox Le Roy Noiseless Ball
 Bearing.....40%
 Wilcox New Century.....50&10&10%
 Wilcox O. K. Steel Track.....50%
 Wilcox O. K. Trolley.....50%
 Wilcox Trolley B'v Bearing.....40%
 Wilcox Wideman Narrow Gauge
 Ball Bearing.....40%
 For Track, see Rail.

Hangers—Garment—

Pullman Trouser, 1/2 gro. 1 pair Flat
 Aluminum, \$9.00; 1 pair Round Nick-
 eled, \$9.00; 4 pair Round Nickeled.....

Victor Folding.....\$27.00
 Western, W. G. Co.....70&10%

Gate—

Myers' Patent Gate Hangers, 1/2 doz.
 net.....\$4.50

Joist and Timber—

Lane Bros. Co.....30%

Hasps—

Griffin's Security Hasp.....50%
 McKinney's Perfect Hasp, 1/2 doz. 50%

Hatchets—

Regular list, first quality.....50%
 Second quality \$1.00 per doz. less
 than first quality.

Heaters, Carriage—

Clark, No. 5, \$1.75; No. 5B, \$2.00; No.
 3, \$2.25; No. 3D, \$2.75; No. 7D, \$3.00;
 No. 3E, \$3.25; No. 1, \$3.50.....15%
 Clark Coal, 1/2 doz. \$0.75.....10%

Hinges—

Blind and Shutter Hinges—
 Surface Gravity Locking Blind:
 (Victor; National; 1888 O. P.;
 Niagara; Clark's O. P.;
 Clark's Tip; Buffalo.)
 No.1 1 1/2 2 3 5
 Doz. pair.....\$0.75 1.35 2.70

Mortise Shutter:

(L. & P. O. S., Dixie, &c.)
 No.1 1 1/2 2 2 1/2
 Doz. pair.....\$0.70 .65 .60 .55

Mortise Reversible Shutter (Buf- falo, &c.):

No.1 1 1/2 2
 Doz. pair.....\$0.70 .65 .60

North's Automatic Blind Fixtures:

No. 2, for Wood, \$9.00; No. 3, for
 Brick, \$11.50.....10%
 Queen City Reversible.....75&10&5%
 Parker Wire Goods Co.:
 Hale & Benjamin Automatic Blind
 Hinges.....20%
 Hale's Blind Awning Hinges, No.
 110, for wood, \$9.00; No. 111, for
 brick, \$9.00.....20%
 Reading's Gravity.....60%
 Sargent's, Nos. 1, 3, 11 and 13, 75&10%
 Stanley's steel Gravity Blind Hinges
 1/2 doz. sets, without screws, \$0.90;
 with screws, \$1.20.

Wrightsville Hardware Co.:

O. S., Lull & Porter.....75&10&5%
 Acme, Lull & Porter.....75&10%
 Queen City Reversible.....75&10%
 Shepard's Noiseless, Nos. 60, 65,
 55.....75&10%
 Niagara, Gravity Locking, Nos. 1,
 3 & 5.....75&10&5%
 1808, Old Pat'n, Nos. 1, 3 & 5.....

Tip Pat'n, Nos. 1, 3 & 5.....75&10&5%
 Buffalo Gravity Locking, Nos. 1,
 3 & 5.....75&10&5%
 Shepard's Double Locking, Nos. 20
 & 25.....70%
 Champion Gravity Locking, No. 75, 75%
 Steamboat Gravity Locking, No. 10, 75%
 Pioneer, Nos. 060, 45 & 3 1/2.....75%
 Empire, Nos. 101 & 103.....70%
 W. H. Co.'s Mortise Gravity Lock-
 ing, No. 2.....60%

Wrought Iron Hinges— Strap and T Hinges, &c., list December 20, 1904:

Light Strap Hinges.....	75¢	Extra
Heavy Strap Hinges.....	75¢	100¢
Light T Hinges.....	65¢	
Heavy T Hinges.....	60¢	
Extra Heavy T Hinges.....	70¢	
Hinge Hasps.....	50¢	
Cor. Heavy Strap.....	75¢	
Cor. Bx. Heavy T.....	70¢	
Screw Hook.....	6 to 12 in. 1b. 34¢	
and Strap.....	1 1/2 to 20 in. 1b. 34¢	
	22 to 36 in. 1b. 34¢	
Screw Hook and Eye:		
1/2 to 1 inch.....	1b. 64¢	
3/4-inch.....	1b. 74¢	
1-inch.....	1b. 84¢	

Hitchers, Stall— Covert Mfg. Co., Stall Hitchers.....35% Hods— Coal—

Inch.....	15	16	17	18
Galv. Open.....	\$2.50	2.75	3.00	3.25
Jap. Open.....	\$1.90	2.10	2.25	2.55
Galv. Funnel.....	\$3.00	3.30	3.60	3.90
Jap. Funnel.....	\$2.45	2.65	2.85	3.30

Masons' Etc.— Cleveland Wire Spring Co.: Steel Brick, No. 182.....each \$0.95 Steel Mortar, No. 183.....each \$1.25

Hoes— Eye— Scovill and Oval Pattern..... 60¢ 10¢ 60¢ 10¢ 10% Grub, list Feb. 23, 1899..... D. & H. Scovill.....30%

Handled—

NOTE.—Manufacturers are selling from the list of September 1, 1904, but many jobbers are still using list of August 1, 1899, or selling at net prices.

Cronk's Weeding No. 1, \$2.00; No. 2, \$2.25
Ft. Madison Cotton Hoe.....70¢ 10¢
Ft. Madison Crescent Cultivator Hoe.....70¢ 10¢
Ft. Madison Mattock Hoes.....70¢ 10¢
Regular Weight.....doz. 66%
Junior Size.....doz. \$4.00
Ft. Madison Sprouting Hoe.....doz. 50%
Ft. Madison Dixie Tobacco Hoe.....75¢ 10¢
Kretzinger's Cut Easy.....75¢ 10¢
Warren Hoe.....45¢ 10¢
W. & C. Ivanhoe.....75¢ 10¢
B. B. 6 in. Cultivator Hoe.....\$3.15
B. B. 6 in. in.....\$3.35
Acme Weeding.....doz. \$4.35
W. & C. L. T. Shufie Hoe.....doz. \$4.85

Hoisting Apparatus— See Machines, Hoisting.

Holders— Bit—

Angular, 1/2 doz. \$21.00.....45¢ 10%

Door—

Bardsley's.....45%
Empire.....50%
Pullman.....50%

File and Tool—

Nicholson File Holders and File Handles.....33% 10¢ 40%

Fruit Jar—

Triumph Fruit Jar Holder, 1/2 gross, \$10.80; 1/2 doz. \$1.25

Hones—Razor—

Pike Mfg. Co., Belgian, German and Swat.....50%

Hooks—Cast Iron—

Bird Cage, Reading.....40%
Bird Cage, Sargent's List.....60% 10%
Ceiling, Sargent's List, Nos. 29, 32, 33, 122, 133 and 135.....50¢ 10¢ 10%
Clothes Line, Reading List.....40%
Clothes Line, Sargent's List.....50¢ 10%
Coat and Hat, Sargent's List.....50¢ 10%
Coat and Hat, Reading.....45¢ 20%
Coat and Hat, Stowell's.....70%
Coat and Hat, Wrightsville.....40%
Harness, Reading List.....60%
School House, Stowell's.....70%

Wire—

Wire C. & H. Hooks.....80¢ 10¢ 10%

Columbian Hdw Co., Gem.....70¢ 10%
Parker Wire Goods Co., King.....70¢ 10%
Van Wagener, Coat and Hat.....70%
Western W. G. Co., Molding.....75%
Wire Goods Co.:
Acme.....60% 10%
Chief.....70%
Crown.....75%
Czar.....65%
V Brace.....75%
Czar Harness.....50% 10%

Wrought Iron—

Box, 6 in., per doz., \$1.00; 8 in., \$1.25; 10 in., \$2.50.

Cotton.....doz. \$1.05@1.25

Wrought Staples, Hooks, &c.—
See Wrought Goods.

Miscellaneous—

Hooks, Bench, See Stops, Bench.

Bush, Light, doz. \$1.75; Medium, \$3.35; Heavy, \$6.25

Grass, best, all sizes, per doz. \$1.60

Grass, common grades, all sizes, per doz. \$1.30

Whiffletree.....lb. 5¢ 6¢

Hooks and Eyes:
Brass.....60¢ 5¢ 60¢ 10¢ 5%
Malleable Iron.....70¢ 70¢ 10%
Covert Mfg. Co. Gate and Scuttle Hooks.....35%
Covert Saddlery Works Self Locking Gate and Door Hook.....60%
Ft. Madison Cut-Easy Corn Hooks.....doz. \$3.25 net

Bench Hooks—See Bench Stops.

Corn Hooks—See Knives, Corn.

Horse Nails— See Nails, Horse.

Horseshoes— See Shoes, Horse.

Hose, Rubber—

Garden Hose, 1/2-inch:
Competition.....ft. 5 @ 6¢
3-ply Guaranteed.....ft. 8 @ 9¢
4-ply Guaranteed.....ft. 10 @ 11¢
Cotton Garden, 3/4-in., coupled:
Low Grade.....ft. 8 @ 9¢
Fair Quality.....ft. 10 @ 11¢

Irons— Sad—

From 1/2 to 10.....lb. 3 @ 3 1/2¢
B. B. Sad Irons.....lb. 3 1/4 @ 3 1/2¢
Mrs. Potts', cents per set:
Nos. 50 55 60 65
Jap'd Tops.....68 65 78 75
Tin'd Tops.....71 68 81 78
New England Pressing.....lb. 3 1/4 @ 4¢

Pinking—

Pinking Irons.....doz. 60¢

Irons, Soldering See Coppers.

Jacks, Wagon—

Covert Mfg. Co.:
Auto Screw.....30¢ 2%
Steel.....45%
Covert's Saddlery Works:
Daisy.....60% 10%
Victor.....60%
Lockport.....50%
Lane's Steel.....30¢ 10¢ 2%
Richards' Tiger Steel, No. 130.....50¢ 10%
Smith & Hemenway Co.'s.....25%

Kettles—

Brass, Spun, Plain.....20¢ 25%
Enameled and Cast Iron—See Ware, Hollow.

Knives—

Butcher, Kitchen, &c.—
Foster Bros. Butcher, &c.....30%
Wilkinson Shear & Cutlery Co.....50%

Corn—

Withington Acme, 1/2 doz. \$2.65;
Dent, \$2.75; Adj. Serrated, \$2.20;
Serrated, \$2.10; Yankee No. 1, \$1.50;
Yankee No. 2, \$1.15.

Drawing—

Standard List.....75¢ 75¢ 10%
C. E. Jennings & Co., Nos. 45, 46, 60;
Jennings & Griffin, Nos. 41, 42.....60%
Ohio Tool Co.'s.....70%
Swan's.....75%
Watrous.....16%
L. & J. White.....20¢ 5¢ 25%

Hay and Straw—

Serrated Edge, per doz. \$5.75@6.00

Iwan's Sickle Edge.....doz. \$9.50

Iwan's Serrated.....doz. \$10.00

Mincing—

Buffalo.....1/2 gro. \$13.00

Miscellaneous—

Farriers'.....doz. \$3.00@3.25

Wostenholm's.....1/2 doz. \$3.00@3.25

Knobs—

Base, 2 1/2-inch, Birch, or Maple,
Rubber Tip.....gro. \$1.25@1.50

Carriage, Jap., all sizes.....gro. 10¢ 15¢

Door, Mineral.....doz. 65¢ 70¢

Door, Por. Jap'd.....doz. 70¢ 75¢

Door, Por. Nickel.....doz. \$2.05@2.15

Bardsley's Wood Door, Shutters, &c. 15%
Picture, Sargent's.....60¢ 10¢ 10%

Lacing, Leather— See Belting, Leather—

Ladders, Store, &c.—

Lane's Store.....25%
Myers' Noiseless Store Ladders.....50%
Richards Mfg. Co.:
Improved Noiseless, No. 112.....50%
Chimax Shelf, No. 113.....50%
Trolley, No. 109.....50%

Ladies, Melting—

L. & G. Mfg. Co. (low list).....25%
P. & W.....50%
Reading.....60%
Sargent's.....50% 10%

Lantern, Tubular—

Regular Tubular, No. 0.....doz. \$1.25@1.50

Lift Tubular, No. 0.....doz. \$1.75@2.00

Hinge Tubular, No. 0.....doz. \$1.75@2.00

Other Styles.....1/2 @ 1/4 65%

Bull's Eye Police—

No. 1, 2 1/2-inch.....\$2.75@3.00

No. 2, 3-inch.....\$3.00@3.25

Lasts and Stands, Shoe—

Stowell's Atlas, Malleable Iron.....50%
Stowell's Badger, Cast Iron.....50%

Latches— Thumb—

Roggin's Latches, with screw.....doz. 35¢ 40¢

Door—

Cronk & Carrier Mfg. Co., No. 101, 1/2 doz. \$2.30

Cronk & Carrier Mfg. Co., Latch, Hasp and Staples.....50%

Richards' Bull Dog Heavy, No. 12.....50% 5%
Richards' Trump, No. 12.....\$1.50

Leaders, Cattle—

Small.....doz. 50¢; large, 60¢
Covert Mfg. Co., Cotton and Hemp.....45%

Lifters, Transom—

R. & E.....33% 4%

Lines—

Wire Clothes, Nos. 18 19 20 100 feet.....\$2.25 2.60 1.75
75 feet.....\$1.75 1.35 1.10
Samsom Cordage Works:
Solid Braided Chalk, Nos. 0 to 3, 40%
Silver Lake Braided Chalk, No. 0, \$6.00; No. 1, \$6.50; No. 2, \$7.00; No. 3, \$7.50.....50%
Masons' Lines, Shade Cord, &c.:
White Cotton, No. 3 1/2, \$1.50; No. 4, \$2.00; No. 4 1/2, \$2.50; Colors, No. 3 1/2, \$1.75; No. 4, \$2.25; No. 4 1/2, \$2.50;
Linen, No. 3 1/2, \$2.50; No. 4, \$3.50;
No. 4 1/2, \$4.50.....20%
Tent and Awning Lines: No. 5, White Cotton, \$7.50; Drab Cotton, \$8.50.....20%
Clothes Lines, White Cotton: 50 ft., \$2.75; 60 ft., \$3.25; 70 ft., \$3.75; 75 ft., \$4.00; 80 ft., \$4.25; 90 ft., \$4.75; 100 ft., \$5.25.....20%
Amnison Waterproof Clothes, 50 ft., \$3.00; 60 ft., \$3.50; Gilt Edge, \$3.00; Air Line, \$23.00; Acme, \$18.00; Alabama, \$17.00; Empire, \$16.00; Advance, \$14.00; Eclipse, \$13.50; Chicago, \$11.50; Standard, \$10.50; Columbia, \$9.50; Allston, \$13.50; Calhoun, \$12.00.

Locks— Cabinet—
Cabinet Locks.....33 1/2 @ 33 1/2 @ 7 1/2 %
Door Locks, Latches, &c.—
NOTE.—Net Prices are very often made on these goods.
Reading Hardware Co.....40%
R. & E. Mfg. Co.....40%
Sargent & Co.....40% 10%
Stowell's Steel Door Latches.....50%
Elevator—
Stowell's.....30%
Padlocks—
Wrought Iron.....75¢ 10¢ 5¢ 80¢ 4%
Net prices are general.
R. & E. Mfg. Co. Wrought Steel and Brass.....75¢ 10%
Sash, &c.—
Ives' Patent:
Bronze and Brass.....62 1/2 %
Crescent.....50% 10%
Iron.....62 1/2 %
Window Ventilating.....60%
Robison Patent Ventilating Sash Lock.....40%
Wrought Bronze and Brass.....55%
Wrought Steel.....50%
Pullman Patent Ventilating Lock.....25%
Reading.....40%

Machines—Boring—

Com. Up'r't, without Augers.....\$2.00

Com. Ang'r, without Augers.....\$2.25

Swan's Improved.....40% 10%
Angular:
Jennings' Nos. 1 and 4.....35¢ 5%
Mills' Falls.....5.75
Snell's, Rice's Pat. 2.50 2.75

Corking—

Reisinger Invinible Hand Power.....1/2 doz. \$18.00

Fence—

Williams' Fence Machines.....each \$5.50

Holisting—

Pulley Block.....30%
Moore's Hand Holist, with Lock Brake.....20%

Ice Cutting—

Chandler's.....12 1/2 %

Washing—

Boss Washing Machine Co.: Per doz.
Boss No. 1.....\$57.00
Boss Rotary.....\$34.00
Champion Rotary Banner No. 1.....\$54.00
Standard Champion No. 1.....\$48.00
Standard Perfection.....\$26.00
Cint. Squire Western.....\$30.00
Uneda American, Round.....\$30.00

Mallets—

Hickory.....45¢ 5¢ 50%
Lignumvite.....45¢ 5¢ 50%
Tinners' Hickory and Apple-wood.....doz. 45¢ 5¢ 50%

Mangers, Stable—

Swett Iron Works.....50%

Mashers, Vegetable—

Western, W. G. Co., Potato.....60% 10%

Mats, Door—

Elastic Steel (W. G. Co.), new list.....50% 10%

Mattocks— See Picks and Mattocks.

Milk Cans—See Cans, Milk.

Mills, Coffee, &c.—

Enterprise Mfg. Co.....25@30%
National List Jan. 1, 1902.....30%
Parker's Columbia & Victoria.....50¢ 10¢ 60%
Parker's Box and Side.....50¢ 10¢ 60%
Swift, Lane Bros. Co.....30%

Mowers, Lawn—

NOTE.—Net prices are generally quoted
Cheapest.....all sizes, \$1.85@2.00
Cheap.....all sizes, \$2.00@2.50
Better Grade.....all sizes, \$2.50@4.50

12 1/2 16 18 in.

High Grade.....\$4.50 4.75 5.00 5.25

Continental.....60¢ 5%
Great American.....70%
Great American Ball B'r'g, new list.....70%
Quaker City.....70%
Pennsylvania.....80% 5%
Pennsylvania, Jr., Ball Bearings.....60%
Pennsylvania Golf.....50%
Pennsylvania Horse.....33 1/2 % 5%
Pennsylvania Pony.....40¢ 5%
Granite State:
Style A, Low Wheel.....70¢ 10¢ 10¢ 5%
Style B, Low Wheel.....70¢ 10¢ 5%
Style C, High Wheel.....70¢ 10%
Style D, High Wheel.....70%
Philadelphia:
Styles M., S., C., K., T.....70¢ 5%
Style A, all Steel.....60¢ 5%
Style E, High Wheel.....70¢ 10¢ 5%
Drexel and Gold Coin, special list.....50%

Nails—

Wire Nails and Brads, Papered,
List July 20, 1899.....85¢ 5¢ 85¢ 10%
Cut and Wire. See Trade Report.

Hungarian, Finishing, Upholsterers' &c. See Tacks.

Horse—

Anchor Nos. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 46

Slater's Felt (roll 500 sq. ft.) .75¢
R. K. M. Stone Surfaced Kooking
(roll 110 sq. ft.) .25¢

Sand and Emery—
Flint Paper and Cloth .60¢@.60¢@10%
Garnet Paper and Cloth .25¢
Emery Paper and Cloth .60¢@.60¢@10%

Parers—Apple—
Advance doz. \$4.00
Baldwin doz. \$4.00
Bonanza Improved each \$6.50
Daisy doz. \$4.00
Dandy each \$7.50
Eureka Improved each \$20.00
Family Bay State doz. \$15.00
Improved Bay State doz. \$36.00
Little Star doz. \$7.00
New Lightning doz. \$3.25
Reading 72 doz. \$6.25
Reading 78 doz. \$6.25
Rocking Table doz. \$6.25
Turn Table 98 doz. \$6.00
White Mountain doz. \$5.00

Potato—
Saratoga doz. \$7.00
White Mountain doz. \$6.00

Picks and Mattocks—
List Feb. 23, 1899 75%
Cronk's Handled Garden Mattock
doz., \$6.40 33%

Pinking Irons—
See Irons, Pinking.

Pins, Escutcheon—
Brass 60¢@.60¢@10%
Iron, list Nov. 11, '85 60¢@.60¢@10%

Pipe, Cast Iron Soil—
Carload lots.
Standard, 2-6 in. 60%
Extra Heavy, 2-6 in. 70%
Fittings 75%

Pipe, Merchant—
Consumers, Carloads.
Steel. Iron.
Blk. Galv. Blk. Galv.
1/2 & 1/4 in. 71% 55% 68 1/2% 52 1/2%
3/4 & 1/2 in. 75% 63% 72 1/2% 60 1/2%
1/2 & 1/4 in. 79% 69% 77% 67%
7 to 12 in. 74% 59% 72% 56 1/2%
Pipe, Vitrified Sewer—
Carload lots.
Standard Pipe and Fittings, 2
to 24 in.:
New England 68%
New York and New Jersey 71%
Maryland, Delaware, E. Pa. 75%
West. Pa. and West Va. 77%
Virginia 76%
Ohio, Michigan and Ky. 77%
Indiana 77%
NOTE.—Carload lots are generally delivered.

Pipe, Stove—
Edwards' Nested Stove Pipe:
C. L. L. C. L.
5 in., per 100 joints \$7.00 \$5.00
6 in., per 100 joints 7.50 5.50
7 in., per 100 joints 8.50 5.50

Planes and Plane Irons—
Wood Planes—
Bench, first qual. 40¢@10%
Bench, second qual. 30¢@10%
Molding 33¢@.33¢@10%
Bailey's (Stanley R. & L. Co.) 40%
Chapin-Stephens Co.:
Bench, First Quality 40¢@.40¢@10%
Bench, Second Quality 50¢@.50¢@10%
Molding 33¢@.33¢@10%
Toy and German 40¢@.40¢@10%
Chapin's 60%
Ohio Tool Co.:
Bench, First Quality 40¢@.40¢@10%
Bench, Second Quality 50¢@.50¢@10%
Molding 33¢@.33¢@10%
Adjustable Wood Bottom 60%
Union 60%

Iron Planes—
Bailey's (Stanley R. & L. Co.) 40%
Chapin's Iron Planes 50¢@10%
Miscellaneous Planes (Stanley R. &
L. Co.) 35%
Ohio Tool Co.'s Iron Planes 60%
Sargent's 60¢@10%
Union 60%

Plane Irons—
Wood Bench Plane Irons—
25¢@10¢@30%
Buck Bros. 30%
Chapin-Stephens Co. 30¢@.30¢@10%
Ohio Tool Co. 30%
Stanley R. & L. Co. 35%
Union 50%
L. & I. J. White 20¢@.20¢@25%

Planners, Corn, Hand—
Kohler's Eclipse doz. \$8.50

Plates—
Felloe lb. 3¢@1¢@4¢
Self-Sealing Pie Plates (R. M. W.
Co.) doz. \$2.00 50%
Pliers and Nippers—
Button Pliers 75¢@10¢@75, 10, 5¢
Gas Burner, per doz., 5 in., \$1.25
@ \$1.30; 6 in., \$1.45 @ \$1.50.
Gas Pipe, 7 8 10 12-in.
\$2.00 \$2.25 \$3.00 \$3.75
Acme Nippers 50¢@5%
Cronk & Carrier Mfg. Co.:
American Button 75¢@10%
Cronk's 60%
Stub's Patent 50%
Combination and others 33%
Heller's Farriers' Nippers, Pincers
and Tools 40¢@10¢@40¢@10%
The Nettleton Mfg. Co. Reversible
Cutting Nippers 50%
P. S. & W. Tinner's Cutting Nip-
pers 60%
Wm. Schollhorn Co.:
Bernard 33%
Elm City 33%
Lodi 50%
Paragon 50%
Swedish Side, End and Diagonal Cut-
ting Pliers 30%
Ultra Drop Forge Tool Co.:
Pliers and Nippers, all kinds 40%
Plumbs and Levels—
Chapin-Stephens Co.:
Plumbs and Levels 30¢@.30¢@10¢@10%
Chapin's Imp. Brass Cor. 10¢@40¢@10¢@10%
Pocket Levels 30¢@.30¢@10¢@10%

Diston's Plumbs and Levels—70%
Diston's Pocket Levels 10%
C. E. Jennings & Co.'s Iron 35%
C. E. Jennings & Co.'s Iron, Adjust-
able B. & L. Co. box 10¢@15%
Stanley R. & L. Co. box 15%
Stanley's Duplex 35%
Woods' Extension 33%

Poachers, Egg—
Buffalo Steam Egg Poachers, doz.
No. 1, \$6.00; No. 2, \$9.00; No. 3,
\$9.00; No. 4, \$12.00 50%

Points, Glaziers—
Bulk and 1-lb. papers, lb. 8 1/2¢@9¢
1/2-lb. papers lb. 9¢@10 1/2¢
1/4-lb. papers lb. 9 1/2¢@10 1/4¢

Pokes, Animal—
Ft. Madison Hawkeye doz. \$3.25
Ft. Madison Western doz. \$4.00

Police Goods—
Manufacturers' Lists 25¢@50¢@5%

Polish—Metal, Etc—
Glasbrite, No. 2, 5 lb can (powder),
each, \$1.25; doz., \$12.00; No. 2, 10 lb
can (cake), each, \$2.50; doz., \$24.00.
Prestoline Liquid, No. 1 (1/2 pt.), doz.
doz., \$3.00; No. 2 (1 qt.), \$9.72 40%
Prestoline Paste 40%
George William Hoffman:

U. S. Metal Polish Paste, 3 oz.
boxes, doz. 50¢; doz. \$4.50.
1/2 lb boxes, doz. \$1.25; 1 lb
boxes, doz. \$2.25
U. S. Liquid, 8 oz. cans, doz.,
\$1.25; doz. \$12.00.
Barkeepers' Friend Metal Polish, doz.
doz., \$1.15; doz. \$18.00.
Wynn's White Silk, 1/2 pt. cans, doz.
doz. \$2.00

Stove—
Black Eagle Benzine Paste, 5 lb cans,
doz. \$10.00
Black Eagle, Liquid, 1/2 pt. cans, doz.
doz. 75¢
Black Jack Paste, 5 lb cans, doz. \$9.00
Black Kid Paste, 5 lb cans, doz. \$9.65
Ladd's Black Beauty Liquid, per
100 tins \$6.75
Joseph Dixon's, doz. \$5.75 10%
Dixon's Plumbago 10%
Pireside doz. \$2.50
Gem, doz. \$4.50 10%
Japanese, doz. \$3.50
Jet Black, doz. \$3.50
Peerless Iron Enamel, 10 oz. cans,
doz. \$1.50

Wynn's:
Black Silk, 5 lb pail each 70¢
Black Silk, 1/2 lb can doz. \$1.00
Black Silk, 5 oz. box doz. \$0.75
Black Silk, 1/2 pt. liq. doz. \$1.00

Poppers, Corn—
1 qt., Square doz. \$9.00
1 qt., Round doz. \$10.00
1/2 qt., Square doz. \$11.00
1/2 qt., Square doz. \$13.00

**Post Hole and Tree Au-
ggers and Diggers—**
See also Diggers, Post Hole, do.
Posts, Steel—
Steel Fence Post, each, 5 ft., 42¢;
6 ft., 46¢; 6 1/2 ft., 48¢.
Steel Hitching Posts each \$1.30

Potato Parers—
See Parers, Potato.
Pots, Glue—
Enameled 40%
Tinned 35%

Powder—
In Canisters:
Duck, 1 lb each 45¢
Fine Sporting, 1 lb each 75¢
Rifle, 1/2 lb each 15¢
Rifle, 1-lb each 25¢
In Kegs:
12 1/2-lb. kegs \$3.50
25-lb. kegs \$4.50
King's Semi-Smokeless:
Keg (25 lb bulk) \$6.50
Half Keg (12 1/2 lb bulk) \$3.50
Quarter Keg (6 1/4 lb bulk) \$1.90
Case 24 (1 lb cans bulk) \$8.50
Half case (1 lb cans bulk) \$4.50
King's Smokeless:
Shot Gun Rifle.
Keg (25 lb bulk) \$12.00 \$15.00
Half Keg (12 1/2 lb bulk) 6.25 7.75
Quarter Keg (6 1/4 lb bulk) 3.25 4.00
Case 24 (1 lb cans bulk) 14.00 17.00
Half case 12 (1 lb c. bk.) 7.25 8.75
Robin Hood Smooth Shot Gun. 50¢@20%

Presses—
Fruit and Jelly—
Enterprise Mfg. Co. 20¢@25%
Seal Presses—
Morrill's No. 1, doz. \$20.00 50%

Pruning Hooks and Shears
See Shears.
Pullers, Cork—
Invincible Cork Puller \$21.00

Pullers, Nail—
Cyclops 50%
Miller's Falls, No. 3, doz. 33%@10%
Morrill's No. 1, Nail Puller, doz. \$20.00
Pearson No. 1, Cyclone Spike Puller,
each \$30.00 50%
Percan, doz. \$9.00 40¢@10%
Scranton Case Lots 35%
No. 2B (large) \$5.50
No. 3B (small) \$5.00
Smith & Hemenway Co.:
Diamond B, No. 2, case lots \$6.00
Diamond B, No. 3, case lots \$5.50
Giant No. 1, doz. \$18; No. 2,
\$16.50; No. 3, \$15 33%
Staple Pullers 60%
Parrot Tack and Stubb Puller, doz.,
75¢; doz. \$6.00

Pulleys, Single Wheel—
Inch 1 1/4 1 1/2 1 3/4 2 3/4
Avining or Tackle 1.05
Hay Fork, Swivel or Solid Eye,
doz., 4 in., \$1.25; 5 in., \$1.35
Inch 1 1/4 1 1/2 1 3/4 2 3/4
Hot House, doz. \$0.65 \$1 1/2 \$1.90

Inch 1 1/4 1 1/2 1 3/4 2 3/4
Screw, doz. \$0.16 .19 .23 .30
Inch 1 1/4 1 1/2 1 3/4 2 3/4
Side, doz. \$0.25 .40 .55 .60
Inch 1 1/4 1 1/2 1 3/4 2 3/4
Stowell's:
Ceiling or End, Anti-Friction. 6¢@10%
Dumb Waiter, Anti-Friction. 6¢@10%
Electric Light 60%
Side, Anti-Friction 60¢@1%

Sash Pulleys—
Common Frame; Square or
Round End, per doz, 1 1/4 and
2 in. 16¢@19¢
Auger Mortise, no Face Plate,
per doz., 1 1/4 and 2 in. 16¢@19¢
Acme 1 1/4 in., 16¢; 2 in., 19¢
Fox-All-Steel, Nos. 3 and 4, 2 in. 50%
Grand Rapids All Steel Noiseless. 50%
Ideal 10¢@10%
Niagara 1 1/4 in., 16¢; 2 in., 19¢
No. 26, Troy. 1 1/4 in., 14¢; 2 in., 16¢
Star 1 1/4 in., 16¢; 2 in., 19¢
Tackle Blocks—See Blocks.

Pumps—
Cistern 60¢@60¢@10%
Pitcher Spout 80¢@80¢@10%
Wood Pumps, Tubing, etc. 45¢@50%
Barnes Dbl. Acting (low list) 50%
Barnes' Pitcher Spout 75¢@10¢@5%
Contractors' Rubber Diaphragm No.
2, B. & L. Block Co. \$16.00
Daisy Spray Pump doz. \$6.75
Flint & Walling's, Fast Mail Hand,
(low list) 55%
Flint & Walling's, Fast Mail (low
list) 55%
Flint & Walling's Tight Top Pitcher. 80%
National Specialty Mfg. Co., Measur-
ing, \$4.00 30%
Mechanical Sprayer \$6.00
Myers' Pump (low list) 50%
Myers' Power Pumps 50%
Myers' Spray Pumps 50¢@10%

Pump Leathers—
Plunger and Lower Valve—Per
gro.:
Inch. 2 2 1/4 2 1/2 2 3/4 2 3/4
\$2.20 2.60 2.75 3.00
Inch. 3 3 1/4 3 1/2 3 3/4 4
\$3.30 3.60 3.85 4.10 4.40
Plunger Cup Leathers—Per 100:
Inch. 2 2 1/4 2 1/2 2 3/4 2 3/4
\$2.75 3.85 5.00 6.00

Punches—
Saddlers' or Drive, good doz. 50¢@75¢
Spring, single tube, good qual-
ity \$1.75@2.00
Revolving (4 tubes) doz. \$3.50@3.75
Bemis & Call Co.'s Cast St'l Drive. 50%
Bemis & Call Co.'s Check 55%
Morrill's Nos. 1A, 1A, 1B, 1C,
\$15.00 50%
Hercules, 1 die, each \$5.00 50%
Niagara Hollow Punches 40%
Niagara Solid Punches 55¢@10%
Wm. Schollhorn Co.:
Bernard 33%
Lodi 50%
Paragon 50%
Steel screw, B. & K. Mfg. Co. 50%
Tinner's Hollow, P. S. & W. Co. 40%
Tinner's Solid, P. S. & W. Co. 40%
doz., \$1.44 60%

Rail—Barn Door, &c.—
Sliding Door, Painted Iron 2 1/4¢@2 1/2¢
Sliding Door, Wrought Brass,
1 1/4 in., lb., 36¢ 30%
Albion Mfg. Co.:
No. 1, Reliable Hgr. Track, ft. 5 1/4¢
No. 2, Reliable Hgr. Track, ft. 7¢
Cronk's:
Double Batted Steel Rail, ft. 2 1/4¢
O. N. T. Rail 2 1/4¢
Griffin:
xxx, 100 ft., 1 x 3-16 in., \$3.00;
1 1/4 x 3-16 in., 3.50.
Hinged Hanger, 100 ft., 1 x 3-16
in., \$3.10; 1 1/4 x 3-16 in., \$3.60.
Lane's:
Hinged Track, 100 ft., 1 in., \$3.40;
1 1/4 in., \$4.10.
O. N. T., 100 ft., 1 in., \$2.75; 1 1/4
in., \$3.50; 1 1/2 in., \$4.00.
Standard, 1 1/4 in. 100 ft. \$4.00
Lawrence Bros.:
100 ft. No. 201, \$4.00; No. 202, \$4.00
New York, 1 x 3-16 in., 100 ft. \$2.75
McKinney:
Hinged Hanger Rail, ft. 11¢ 50%
None Better ft. 3 1/4¢
Standard ft. 4¢
Myers' Stayon Track 60¢@10%
Richards' Mfg. Co.:
Common 1 x 3-16 in., \$2.25; 1 1/4 x
3-16, \$2.50; 1 1/2 x 3-16, \$2.75.
Special Hinged Hanger Rail 60¢@10%
Lag Screw Rail, No. 65 50%
Gauge Trolley Track, ft. No. 31,
9¢; No. 32, 14¢; No. 33, 20¢
Safety Door Hanger Co.'s Storm
King Safety 60%
Safety Door Hanger Co.'s U. S.
Standard 60%
Stowell's:
Cast Rail ft. 1 1/4¢
Steel Rail, Plain 25%
Wrought Bracket, 1 1/2 in. ft. 3¢
Wrought Bracket, 1 1/4 x 5-16 in. ft. 4¢
Swett's Hylor, ft. 11¢ 60%
P. L. 3-16 Steel Rail 100 ft. \$3.00
No. 0, 1 x 3-16 100 ft. \$2.75

Rakes—
NOTE.—Manufacturers are
selling from the list of September
1, 1904, but many jobbers are still
using list of August 1, 1899, or
selling at net prices.
Fort Madison Red Head Lawn \$3.25
Fort Madison Blue Head Lawn \$2.75
Jackson Lawn, 29 and 30 teeth, doz.,
net \$4.25
Cronk's:
New Champion Garden, doz. 12
teeth, \$15.00; 14, \$16.50; 16, \$18.00. 75%
Victor Garden, doz. 12 teeth,
\$15.00; 14, \$16.50; 16, \$18.00 80%
Queen City Lawn, doz., 20 teeth,
\$3.45; 24, \$3.60 net
Anticlog Lawn, doz. \$1.00
Malleable Garden 70¢@10%

Kohler's:
Lawn Queen, 20-tooth doz. \$3.45
Lawn Queen, 24-tooth doz. \$3.60
Paragon, 20-tooth doz. \$2.75
Paragon, 24-tooth doz. \$3.00
Steel Garden, 14-tooth doz. \$2.40
Malleable Garden, 14-tooth, doz.,
\$1.75@2.00

Weldless Steel Garden 75¢@5%
Rasps, Horse—
Diston's 75%
Heller Bros. 70¢@70¢@10¢@10%
McCaffrey's American Std. 60¢@10¢@5%
New Nicholson 70¢@10¢@75%
See also Files.

Razors—
Boras-1 C. 60%
Fox Razors, No. 42, doz. \$20.00 40%
Fox Razors, No. 44, doz. \$20.00 40%
Fox Razors, No. 82, Platina, doz.,
\$25.00 50%
Red Devil 50%
Silberstein:
Carbo Magnetic \$18.00
Griffin, No. 65 \$12.00
Griffin, No. 90 \$12.00
All other Razors 40%

Safety Razors—
40%
Reels, Fishing—
Hendry's:
M 6, Q 6, A 6, B 6, M 9 1/4, M 16,
Q 16, A 16, B 16, 4008, Rubber,
Populo, Nickeled Populo 20%
Aluminum, German, Altr., Bronze. 25%
1240 N, 124 N, 6 RM, G 9 20%
3004 N, 6 N, 6 RM, G 9 20%
2904 P, 24 N, 24 N, 26 PN 20%
2904 PN 33%
0924 N 33%
02084 N 33%
02094 PN 33%
802 N, 2904 N, 974 PN 33%
5009 PN, 5009 N 20%
Competitor, 102 P, 102 PN, 202 P,
202 PN, 102 PR, 202 PR 20%
304 P, 304 PN, 00304 P, 00304 PN. 33%
Registers—List July 1, 1903.
Japanned, Electroplated and
Bronzed 70¢@10%

Revolvers—
Single Action 95¢@1.00
Double Action, except 4 1/2 cal. \$1.85
Double Action, 4 1/2 caliber \$2.00
Automatic \$3.45
Hammerless \$4.00
Riddles, Hardware Grade
16 in. per doz. \$2.25@2.50
17 in. per doz. \$2.50@2.75
18 in. per doz. \$2.75@3.00

Rings and Ringers—
Bull Rings—
2 1/4 3 inch.
Steel \$0.70 1.75 0.80 doz.
Copper \$1.00 1.15 1.40 doz.
Rea's Improved Self-Piercing Cop-
per, 2 in., doz. \$1.25; 2 1/4 in.,
\$1.50; 3 in., \$1.75.
Hog Rings and Ringers—
Hill's Rings, gro. boxes \$1.00@4.50
Hill's Ringers, Gray Iron doz. 50¢@55¢
Hill's Ringers, Malleable Iron doz. 70¢@75¢
Blair's Rings, per doz. \$1.75@5.25
Blair's Ringers, per doz. \$0.60@.65
Brown's Rings, per doz. \$0.35@.50
Brown's Ringers, per doz. \$0.60@.65
Rivets and Burrs—
Copper 45%
Iron or Steel 75¢@75¢@5%
Bifurcated and Tubular—
Assorted in Boxes.
Slotted Clinch, per doz. boxes,
pasteboard boxes, 23¢@25¢; Tin
boxes, 29¢@32¢.
Tubular, per doz. boxes, 50 count,
29¢@32¢; 100 count, 51¢@58¢.

Rollers—
Acme, Stowell's Anti-Friction 50%
Barn Door, Sargent's list 60%
Cronk's Stay No. 65, \$0.90; No.
50 \$1.40
Cronk's Brinkerhoff No. 55, \$0.60;
No. 56 \$0.94
Lane's Stay 40%
Richards' Stay:
Handy Adj. and Reversible No. 53, 75¢
O. K. Adj. and Reversible No. 58, 80¢
Lag Screw, Nos. 59, 60 50%
Underwriters', Nos. 59, 60 50%
Favorite, No. 54 60%
Stowell's Barn Door Stay, doz. \$1.00
Swett's Anti-Friction 50%
Screw and Spike Stay doz. 65¢
Hinge Adjustable Stay doz. 90¢

Rope—
Manila, 7-16 in. diam. and larger:
Pure lb., 12 1/4¢
Steel, 7-16 in. diam. and larger:
Pure lb., 10¢
Steel, 7-16 in. diam. and larger:
No. 2 quality lb. 8¢
Steel, Hay, Hide and Bale
Ropes, Medium and Coarse:
Mixed lb. 8¢
Pure lb. 10¢
Steel, Tarred, Medium Lath
Yarn, Coarse and Untarred:
Mixed lb. 8¢
Pure lb. 10¢
Cotton Rope:
Best, 1/4-in. and larger. 16 1/4¢@18¢
Medium, 1/4-in. and larger. 15 1/4¢@16 1/4¢
Common, 1/4-in. and larger. 10¢
In coils, 1/2¢ advance.
Jute Rope:
Thread No. 1, 1/4-in. & up, lb. 6 1/4¢
Thread No. 2, 1/4-in. & up, lb. 5 1/4¢
Old Colony Manila Transmission
Rope lb. 17 1/2¢
Wire Rope—
Galvanized 37 1/4¢@2 1/4¢
Plain 45¢@2 1/4¢

Ropes, Hammocks—

Covert Mfg. Co.:	50%
Jute	30&10%
Sisal	30&10%
Covert Saddlery Works	60&5%

Rulers, Desk—

Stimpson & Son:	30&10%
Boxwood and Maple	30&10%

Rules—

Boxwood	60&10&10%
Ivory	35&10&35&10&10%

Chapin-Stephens Co.:

Boxwood	60&10&10%
Flexiford	27&10&10&27&10%

Ivory	50&30&10&10%
Miscellaneous	50&30&10&10%

Combination	55&55&10%
Stationers'	10&10&10%

Keuffel & Esser Co.:

Folding, Wood	35&10%
Folding, Steel	33&10%

Lufkin's Steel	30&10%
Lufkin's Lumber	30&10%

Stanley R. & L. Co.:	60%
Boxwood	60%

Ivory	40%
Miscellaneous	40%

Zig Zag	40%
Zig Zag, Pin Joint	45%

Upson Nut Co.:

Boxwood	40&60&10%
Ivory	35&10&35&10&10%

Sash Balances—

See Balance, Sash.

Sash Locks—

See Locks, Sash.

Sash Weights—

See Weights, Sash.

Sausage Stuffers or Fillers

See Stuffers or Fillers, Sausage.

Saw Frames—

See Frames, Saw.

Saw Sets—

See Sets, Saw.

Saw Tools—

See Tools, Saw.

Saws—

Atkins':

Circular	50%
Band	50&10&60%

Cross Cuts	35&45%
Mulay, Mill and Drag	50%

One-Man Saw	50%
Wood Saws	40%

Hand, Compass, &c.	40%
Chapin-Stephens Co.:	30&30&10%

Turning Saws and Frames	30&30&10%
Diamond Saw & Stamping Works	30&10&10%

Sterling Kitchen Saws	30&10&10%
Diaston's:	50%

Circular, Solid and Ins'ted Tooth	50%
Band, 2 to 14 in. wide	60%

Band, 1/4 to 1 1/2	60%
Crosscuts	55%

Narrow Crosscuts	50%
Mulay, Mill and Drag	50%

Framed Woodsaws	35%
Woodsaw Blades	35%

Woodsaw Rods	25%
Hand Saws, Nos. 12, 9, 9, 16, 4100	40%

Hand Saws, Nos. 7, 10, 10 1/2, 3, 1	30%
0, 00, Combination	30%

Compass, Key Hole, &c.	25%
Butcher Saws and Blades	35%

C. E. Jennings & Co.'s:	25%
Back Saws	30%

Butcher Saws	30%
Compass and Key Hole Saws	35&5%

Framed Wood Saws	30%
Hand Saws	20&25%

Wood Saw Blades	35%
Millers Falls:	15&10%

Butcher Saws	15&10%
Star Saw Blades	15&10%

Peace & Richardson's Hand Saws	30%
Simonds':	50%

Circular Saws	50%
Crescent Ground Cross Cut Saws	35%

Gang Mill, Mulay and Drag Saws	50%
Band Saws	50%

Back Saws	25&25&17 1/2%
Butcher Saws	35&35&17 1/2%

Hand Saws	25&25&17 1/2%
Hand Saws, Bay State Brand	50%

Compass, Key Hole, &c.	25&25&17 1/2%
Wood Saws	35&35&17 1/2%

Springfield Mach. Screw Co.:	40&10&50%
Diamond Kitchen Saws	40&10&50%

Butcher Saws Blades	35&40%
Wheeler, Madden & Clemson Mfg. Co.'s Cross Cut Saws, The Best	35%

Hack Saws

Atkins' Hack Saw Blades A A A	25%
Diaston's:	25%

Concave Blades	25%
Keystone	40%

Hack Saw Frames	30%
Pittsburg File Works, The Best	35%

C. E. Jennings & Co.'s:	35%
Hack Saw Frames, Nos. 175, 180	40&7 1/2%

Hack Saws, Nos. 175, 180, complete	40&7 1/2%
Goodell's Hack Saw Blades	40%

Griffin's Hack Saw Frames	35&5&10%
Griffin's Hack Saw Blades	35&5&10%

Springfield Mach. Screw Co.:	35%
Diamond Hack Saw Frames	50%

Star Hack Saws and Blades	15&10%
Sterling Hack Saw Blades	30&10&5%

Sterling Hack Saw Frames	30&10&5%
Sterling Power Hack Saw Machines	10%

each, No. 1, \$25.00; No. 2, \$30.00	10%
Victor Hack Saw Blades	25%

Victor Hack Saw Frames	40%
Scroll—	25%

Barnes' No. 1, \$15	40%
Barnes' Scroll Saw Blades	40%

Barnes' Velocipede Power Scroll Saw	40%
without boring attachment, \$18	40%

with boring attachment, \$30	20%
Lester, complete, \$10.00	15&10%

Rovers, complete, \$4.00	15&10%
Scalers, Fish—	60&10%

Covert's Saddlery Works	60&10%
Scales—	50&50&10%

Family, Turnbull's	50&50&10%
Counter:	50&50&10%

Hatch, Platform, 1/2 oz. to 1 lb.	30%
1 lb.	30%

Two Platforms, 1/2 oz. to 8 lbs.	30%
1 lb.	30%

Two Platforms, 1/2 oz. to 8 lbs.	30%
1 lb.	30%

Two Platforms, 1/2 oz. to 8 lbs.	30%
1 lb.	30%

Two Platforms, 1/2 oz. to 8 lbs.	30%
1 lb.	30%

Two Platforms, 1/2 oz. to 8 lbs.	30%
1 lb.	30%

Two Platforms, 1/2 oz. to 8 lbs.	30%
1 lb.	30%

Two Platforms, 1/2 oz. to 8 lbs.	30%
1 lb.	30%

Two Platforms, 1/2 oz. to 8 lbs.	30%
1 lb.	30%

Two Platforms, 1/2 oz. to 8 lbs.	30%
1 lb.	30%

Two Platforms, 1/2 oz. to 8 lbs.	30%
1 lb.	30%

Two Platforms, 1/2 oz. to 8 lbs.	30%
1 lb.	30%

Two Platforms, 1/2 oz. to 8 lbs.	30%
1 lb.	30%

Union Platform, Plain.

Union Platform, Stpd.	\$1.70@1.90
Union Platform, Stpd.	\$1.85@2.15

Chattillon's:	25%
Eureka	40%

Favorite	40%
Crocker's Trip Scales	50%

Chicago Scale Co.:	50%
The "Little Detective"	50%

Union or Family No. 2	60%
Portable Platform (reduced list)	50%

Wagon or Stock (reduced list)	25&35%
"The Standard" Portables	50%

"The Standard" R. R. and Wagon	50%
Scrapers—	50%

Box, 1 Handle	doz. \$2.00@2.25
Box, 2 Handle	doz. \$2.60@2.85

Ship, Light, \$2.00; Heavy, \$4.50	
Adjustable Box Scraper (S. R. & Co.)	\$6.00

Chapin-Stephens Co., Box	30&30&10&10%
Screens, Window and Frames—	60&10%

Air Line Pattern Screens	60&10%
Flyer Pattern Screens	60&10&10&5%

Maine Screen Frames	40&10&5%
Perforated Screens	60&10&60&10&5%

Phillips' Screen Frames	60&5&60&10%
See also Doors.	

Screws—Bench and Hand

Bench, Iron, doz.	\$2.50@
2 1/2; 1 1/2, \$3.00@3.25; 1 1/4, \$3.50@3.75	

Bench, W'd, Beech, doz.	30&30&5%
Hand, Wood	30&30&5%

R. Bliss Mfg. Co., Hand	30&30&10%
Chapin-Stephens Co., Hand	30&30&10%

Ohio Tool Co., Bench and Hand	30%
Coach, Lag and Hand Rail—	75&15%

Lag, Cone Point, list Oct. 1	75&15%
Coach, Gimlet Point, list	75&10%

Oct. 1, '99	75&10%
Hand Rail, list Jan. 1, '01	70&10&75%

Jack Screws—

Standard List	80&80&5%
Millers Falls	50&10&10%

Millers Falls, Roller	50&10%
P. S. & W.	50%

Sargent	70&10%
Swett Iron Works	75&10&80&5%

Machine—

List Jan. 1, '98:	
Flat or Round Head, Iron	50&50&10%

Flat or Round Head, Brass	50&50&10%
Set and Cap—	80%

Set (Iron), net advance over	25%
Iron	25%

Sq. Hd. Cap	75%
Hex. Hd. Cap	75%

Rd. Hd. Cap	60&10%
Fullister Hd. Cap	60&10&10%

Wood

List July 23, 1903:	
Flat Head, Iron	87 1/2&100%

Round Head, Iron	85&100%
Flat Head, Brass	85&100%

Round Head, Brass	80&100%
Flat Head, Bronze	77 1/2&100%

Round Head, Bronze	75&100%
Drive Screws	87 1/2&100%

Scroll Saws—

See Saws, Scroll.	
Scythes—	Per doz.

Grass, No. 1, Plain Finish	\$6.25
Clipper, Branzen Webb	\$6.50

No. 3 Clipper, Pol'd Webb	\$6.75
No. 6 Clipper & Solid Steel	\$7.00

Bush, Weed & Bramble, No. 2	\$6.50
Grain, No. 1	\$8.25

Bronzed Webb, No. 1	\$8.50
Nos. 3 & 4 Clipper, Grain	\$8.75

Solid Steel No. 6	\$9.25
Seeders, Raisin—	25&30%

Enterprise	25&30%
Sets—Awl and Tool—	60&10%

Aiken's Sets, Awl and Tools:	60&10%
No. 20, 3 doz.	\$10.00

Fray's Adj. Tool Handles, Nos. 1, 12;	\$12;
2, 18; 3, 12; 4, 12; 5, 12	\$3.75

C. E. Jennings & Co.'s Model Tool	30%
Holders	30%

Millers Falls Adj. Tool Handles, No. 1	\$12; No. 4, \$12; No. 5, \$18—15&10%
Garden Tool Sets—	15&10%

Ft. Madison Three Plows, Hoe, Rake	and Shovel
and Shovel	30 doz sets \$9.00

Octagon	30 doz. \$3.50@3.75
Buck Bros.	25%

Cannon's Diamond Point	30 doz. \$12.40
Mayhew's	30 doz. \$9.00

Snell's Cor'gated, Cup Pt.	30 doz. \$7.20
Snell's Knurled, Cup Pt.	30 doz. \$7.20

Springfield Mach. Screw Co.:	30 doz. \$7.50
Diamond Knurled Cup Pt.	30 doz. \$7.50

Rivet—

Regular list	75&75&10%
Saw—	50&10%

Aiken's:	50&10%
Genuine	50&10%

Imitation	50&10%
Atkins':	40%

Criterion	40%
Adjustable	40%

Bemis & Call Co.'s:	30%
Cross Cut	30%

Plate	20%
Disston's Star and Monarch	25%

Morrill's No. 1, \$15.00	50%
Nos. 3 and 4, Cross Cut, \$30.00	50%

Roy Red Slips.....	30¢
Washita Slips, Extra.....	30¢
Washita Slips, No. 1.....	70¢
Washita Slips, No. 2.....	40¢
India Oil Stones (entire list).....	33 1/2%
Quickcut Emery and Corundum Oil Stone, Double Grit.....	33 1/2%
Quickcut Emery and Corundum Axe Stone, Double Grit.....	33 1/2%
Quickcut Emery Rubbing Bricks.....	33 1/2%
Hindustan No. 1, R's lar. 1 lb 8¢	
Hindustan No. 1, Small, 1 lb 10¢	
Axe Stones (all kinds).....	2 1/4%
Turkey Oil Stones, Extra, 5 to 8 in.....	1 lb 80¢
Queer Creek Stones, 4 to 8 in.....	20¢
Queer Creek Slips.....	40¢
Sand Stone.....	6¢

Scythe Stones—	
Chicago Wheel & Mfg. Co.: Gem Corundum, 10 in., \$8.00 gro., 12 in., \$10.80	
Norton Emery Scythe Stones: Less than gross lots.....	gro. \$9.00
One gross or more.....	gro. \$7.20
Lots of 10 gross or more.....	gro. \$6.00
Pike Mfg. Co., 1901 list.....	
Black Diamond S. S., 1/2 gro. \$12.00	
Lamotte S. S., 1/2 gro. \$11.00	
White Mountain S. S., 1/2 gro. \$9.00	
Green Mountain S. S., 1/2 gro. \$8.00	
Extra Indian Pond S. S., 1/2 gro. \$7.50	
No. 1 Indian Pond S. S., 1/2 gro. \$7.00	
No. 2 Indian Pond S. S., 1/2 gro. \$4.50	
Leader Red End S. S., 1/2 gro. \$4.50	
Quick Cut Emery.....	gro. \$10.00
Pure Corundum.....	gro. \$18.00
Crescent.....	gro. \$7.00
Emery Scythe Rifles, 2 Coat, \$8	
Emery Scythe Rifles, 3 Coat, \$10	
Emery Scythe Rifles, 4 Coat, \$12	
Balance of 1904 list 33 1/2%	

Stoppers, Bottle—	
Victor Bottle Stoppers.....	gro. \$9.00

Stops—Bench—	
Millers Falls.....	15¢ 10%
Morrill's, 1/2 doz., No. 1, \$10.00.....	50¢
Morrill's, No. 2, \$12.50.....	50¢

Door—	
Chapin-Stephens Co.....	60¢ 60¢ 10%

Plane—	
Chapin-Stephens Co.....	20%

Straps—Box—	
Cary's Universal, case lots.....	25¢ 20%

Hame—	
Covert's Saddlery Works.....	60¢ 10%

Stretchers, Carpet—	
Cast Iron, Steel Points, doz.	60¢ 60¢ 10%

Socket.....	doz. \$1.60
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Excelsior Stretcher and Tack Hammer Combined, 1/2 doz. \$6.00.....	20%
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Stuffers, Sausage—	
Enterprise Mfg. Co.....	25¢ 25¢ 7 1/2%

National Specialty Co., list Jan. 1, 1902.....	30¢ 5%
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Sweepers, Carpet—	
National Sweeper Co.: Louis XV, Roller Bearing, \$120.00 Plated.....	doz. \$120.00

Hepplewhite, Roller Bearing, Silver Plated.....	\$72.00
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Sheraton, Roller Bearing, N'kel \$60.00	
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Ye Mission, Roller Bearing, Oxidized Coppered.....	\$36.00
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Transparent, Roller Bearing, Plate Glass top, Nickelized.....	\$36.00
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National Queen, Roller Bearing, Fancy Veneers.....	\$27.00
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Loyal, Roller Bearing, Veneers, Nickelized.....	\$25.00
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Triple Medal, Roller Bearing, Nickelized.....	\$24.00
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Marion, Roller Bearing, N'kel \$24.00	
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Marion Queen, Roller Bearing, Nickelized.....	\$24.00
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Monarch, Roller Bearing, N'kel \$22.00	
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Monarch, Roller Bearing, Jap. \$20.00	
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Perpetual, Regular B'r'gs, N'kel \$20.00	
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Perpetual, Regular B'r'gs, Jap. \$18.00	
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Monarch Extra (17 in. case), Roller Bearing, Nickelized.....	\$36.00
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Monarch Extra (17 in. case), Roller Bearing, Japanned.....	\$36.00
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Auditorium (28 in. case), Roller Bearing, Nickelized.....	\$54.00
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Mammoth (30 in. case), Roller Bearing, Nickelized.....	\$60.00
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NOTE—Rebates: 50¢ per dozen on three-dozen lots; \$1 per dozen on five-dozen lots; \$1 per dozen on ten-dozen lots; \$2.50 per dozen on twenty-five-dozen lots.	
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Streator Metal Stamping Co.: Model E, Sanitaire.....	1/2 doz. \$25.00
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Model A, Sterling.....	1/2 doz. \$25.00
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Model B, Sterling, Nickelized.....	1/2 doz. \$23.00
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Model B, Sterling, Japanned.....	1/2 doz. \$21.00
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Model C, Sterling.....	1/2 doz. \$21.50
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Model D, Sterling.....	1/2 doz. \$19.50
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Tacks, Finishing Nails, &c.	
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New List, May 1, 1905.	
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American Carpet Tacks, 90¢ 37 1/2%	
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American Cut Tacks.....	90¢ 37 1/2%
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Suedes Cut Tacks.....	90¢ 37 1/2%
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Suedes Upholsterers' Tacks.....	90¢ 50%
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Gimp Tacks.....	90¢ 50%
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Lace Tacks.....	90¢ 50%
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Trimmers' Tacks.....	90¢ 37 1/2%
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Looking Glass Tacks.....	65¢
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Bill Posters' and Railroad Tacks.....	90¢ 50%
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Hungarian Nails.....	85¢
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Finishing Nails.....	70¢
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Clout and Clout Nails.....	40¢ 5%
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NOTE.—The above prices are for Standard Weights. An extra 5¢ is given on Medium Weights and an extra 10¢ 5% is given on Light weights.	
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Miscellaneous—	
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Double Pointed Tacks.....	90¢ 6¢ 7 tena
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Steel Wire Brads, R. & E. Mfg. Co.'s list.....	50¢ 10¢ 20¢
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See also Nails, Wire.	
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Tanks, Oil—	
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Emerald, R. M. W. Co.....	30-gal. \$3.40
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Emerald, R. M. W. Co.....	60-gal. \$4.25
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Queen City, R. M. W. Co.....	30-gal. \$3.65
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Queen City, R. M. W. Co.....	60-gal. \$4.50
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Tapes, Measuring—

American Asses' Skin.....	50¢ 10%
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Patent Leather.....	25¢ 30¢ 5%
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Steel.....	33 1-3-65%
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Chesterman's.....	25¢ 25¢ 5%
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Eddy Asses' Skin.....	40¢ 100¢ 5%
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Eddy Patent Leather.....	25¢ 30¢ 5%
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Eddy Steel.....	40¢ 40¢ 10%
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Keuffel & Esser Co.: Favorite, Ass Skin.....	40¢ 100¢ 50%
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Favorite, Duck and Leather.....	25¢ 30¢ 5%
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Metallic and Steel, lower list.....	35¢ 35¢ 5%
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Pocket.....	35¢ 35¢ 5%
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Lufkin's: Asses' Skin.....	40¢ 100¢ 50%
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Metallic.....	30¢ 30¢ 5%
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Patent Bend, Leather.....	25¢ 30¢ 5%
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Pocket.....	40¢ 40¢ 5%
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Steel.....	33 1/2 35%
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Teeth, Harrow—

Steel Harrow Teeth, plain or headed, 3/8-inch and larger.....	per 100 lbs. \$2.75 to \$3.00
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Thermometers—

Tim Case.....	80¢ 100¢ 80¢ 10¢ 5%
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Ties, Bale—Steel Wire

Single Loop.....	80¢ 2 1/2%
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Monitor, Cross Head, &c.....	70%
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Niagara Brick Ties.....	25¢ 10%
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Tinners' Shears, &c.—

See Shears, Tinners, &c.	
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Tinware—

Stamped, Japanned and Pieced, sold very generally at net prices.	
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Tips, Safety Pole—

Covert's Saddlery Works.....	60¢ 10%
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Tire Benders, Upsetters, &c.

See Benders and Upsetters, Tire.	
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Tools—Coopers'—

L. & I. J. White.....	20¢ 20¢ 5%
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Hay—

Myers' Hay Tools.....	50%
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Stowell's Hay Carriers.....	50%
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Stowell's Hay Forks.....	50%
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Stowell's Fork Pulleys.....	50%
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Miniature—

Smith & Hemenway Co.'s.....	25%
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Saw—

Atkins' Cross Cut Saw Tools.....	40%
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Simonds' Improved.....	33 1/2%
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Simonds' Crescent.....	25%
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Ship—

L. & I. J. White.....	25%
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Transom Lifters—

See Lifters, Transom.	
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Traps—Fly—

Balloon, Globe or Acme, doz.	\$1.15 to \$1.25
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Harper, Champion or Paragon, doz. \$1.25 to \$1.40; gro. \$13.00 to \$13.50	
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Game—

Imitation Onocida.....	75¢ 75¢ 5%
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Newhouse.....	30¢ 45¢ 5%
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Hawley & Norton.....	65%
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Victor.....	70¢ 10%
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Onocida Community Jump.....	50%
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Mouse and Rat—

Mouse, Wood, Choker, doz. holes	85¢ 9¢
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Mouse, Round or Square Wire	doz. \$5.90 to \$6.00
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Marty French Rat and Mouse Traps (Genuine).....	
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No. 1, Rat, each \$1.21; 1/2 doz. \$13.25	
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No. 3, Rat, 1/2 doz. \$6.50; case of 50	\$5.75 doz.
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No. 3 1/2, Rat, 1/2 doz. \$5.25; case of 72	gro. \$4.70 doz.
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No. 4, Mouse, 1/2 doz. \$3.85; case of 150	\$3.00 doz.
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No. 5, Mouse, 1/2 doz. \$3.00; case of 150	\$2.25 doz.
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Trimmers, Spoke—

Wood's E I.....	50%
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Trowels—

Disston Brick and Pointing.....	30%
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Disston Plastering.....	25%
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Disston "Standard Brand" and Garden Trowels.....	35%
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Kohler's Steel Garden Trowels, 5 in.	1/2 doz. \$1.80
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Kohler's Steel Garden Trowels, 6 in.	1/2 doz. \$1.80
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Never-Break Steel Garden Trowels.....	1/2 doz. \$6.00
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Rose Brick and Plastering.....	25¢ 5%
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Woodrough & McParlin, Plastering.....	25%
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Trucks, Warehouse, &c.—	
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B. & L. Block Co.: New York Pattern.....	50¢ 10%
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Western Pattern.....	50¢ 10%
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Handy Trucks.....	1/2 doz. \$18.00
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Grocery.....	1/2 doz. \$15.00
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Daisy Store Trucks, Improved Pattern.....	1/2 doz. \$18.50
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McKinney Trucks.....	each \$10.00
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Model Store Trucks.....	1/2 doz. \$18.50
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Tubs, Wash—	
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No. 1 2 3	
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Galvanized, per doz. \$4.25 4.75 5.25	
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Galvanized Wash Tubs (R. M. W. Co.) 1 No. 1 2 3 10 20 30	
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Per doz., net \$5.70 6.30 7.20 6.60 7.20 8.13	
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Twine, Miscellaneous—	
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Flax Twine:	
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No. 2, 1/4 and 1/2-lb. Balls, 22¢ 21¢	
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No. 18, 1/4 and 1/2-lb. Balls, 18¢ 20¢	
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No. 18, 1/4 and 1/2-lb. Balls, 16¢ 18¢	
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No. 24, 1/4 and 1/2-lb. Balls, 16¢ 18¢	
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No. 36, 1/4 and 1/2-lb. Balls, 15¢ 17¢	
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Chalk Line, Cotton 1/4-lb. Balls.....	25¢ 30¢
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CURRENT METAL PRICES.

The following quotations are for small lots. Wholesale prices, at which large lots only can be bought, are given elsewhere in our weekly market report.

IRON AND STEEL—

Bar Iron from store—

Refined Iron:	
1 to 1 1/2 in. round and square.....	per lb 2.15¢
1 1/2 to 4 in. x 3/4 to 1 in.....	per lb 2.35¢
1 1/2 to 4 in. x 1/2 to 3/4 in.....	per lb 2.35¢
Rods—3/4 and 1 1/2 round and square.....	per lb 2.35¢
Angles—	
3 in. x 1/2 in. and larger.....	per lb 2.35¢
3 in. x 3/4 in. and 1/2 in.....	per lb 2.35¢
1 1/2 to 2 1/2 in. x 1/2 in.....	per lb 2.35¢
1 1/2 to 2 1/2 in. x 3/4 in. and thicker.....	per lb 2.35¢
1 to 1 1/2 in. x 3/4 in.....	per lb 2.35¢
1 to 1 1/2 in. x 1/2 in.....	per lb 2.35¢
3/4 x 1/2 in.....	per lb 2.35¢
3/4 x 3/4 in.....	per lb 2.35¢
3/4 x 1 in.....	per lb 2.35¢
1/2 x 3/4 in.....	per lb 2.35¢
1/2 x 1 in.....	per lb 2.35¢
Tees:	
1 in.....	per lb 2.65¢
1 1/2 in.....	per lb 2.45¢
1 1/2 to 2 1/2 in.....	per lb 2.35¢
3 in. and larger.....	per lb 2.35¢
Beams.....	per lb 2.5¢
Channels, 3 in. and larger.....	per lb 2.35¢
Rails—1 1/2 to 6 x 3/4 to No. 8.....	per lb 2.35¢
Burden's Best Iron, base price.....	per lb 3.05¢
Burden's "H. B. & S." Iron, base price.....	per lb 3.05¢
"Ulster".....	per lb 3.10¢
Norway Bars.....	per lb 3.30¢
Norway Shapes.....	per lb 3.30¢

Merchant Steel from Store—

Bessemer Machinery.....	per lb 2.00¢
Toe Calk, Tire and Sleigh Shoe.....	per lb 2.30¢
Best Cast Steel, base price in small lots.....	per lb 2.75¢

Sheets from Store—

Black.

	One Pass, C.R.	R. G.
	Soft Steel.	Cleaned.
No. 14.....	per lb 2.55¢	2.60¢
Nos. 18 to 21.....	per lb 2.75¢	2.80¢
No. 27.....	per lb 2.90¢	3.10¢
No. 28.....	per lb 3.00¢	3.20¢

Russia, Planished, &c.

Genuine Russia, according to assort- ment.....	per lb 11 1/4¢
Patent Planished.....	per lb 10¢; B, 9¢, net.

Galvanized.

Nos. 14 to 16.....	per lb 2.95¢
Nos. 22 to 24.....	per lb 3.5¢
No. 27.....	per lb 3.80¢
No. 28.....	per lb 4.05¢
No. 30 and lighter 36 inches wide, 25¢ higher.	

METALS—

Tin—

Straits Pig..... per lb 36 1/4¢

Tin Plates—

American Charcoal Plates (per box.)

A. A. Charcoal:..... \$5.80

IX, 14 x 20..... 7.00

A. Charcoal:..... \$5.5

IX, 14 x 20..... 6.15

American Coke Plates—Bessemer—

IX, 14 x 20..... 108 lb \$4.15

IX, 14 x 20..... 5.15

American Terne Plates—

IX, 20 x 28..... \$8.30

IX, 20 x 28..... 10.30

Copper—

Lake Ingot..... per lb 19 1/4¢

Casting..... per lb 18 1/4¢

Sheet Copper Hot Rolled, 16 oz..... per lb 21¢

Sheet Copper Cold Rolled, 1¢ advance over Hot Rolled..... 14¢

Sheet Copper Polished 20 in. wide and under, 1¢ advance over Cold Rolled..... 27¢

Sheet Copper Polished over 20 in. wide, 2¢ advance over Cold Rolled..... 29¢

Bottoms, Pits and Flats..... per lb 27¢ basis

Planished Copper, 1¢ advance more than Polished.....

Seamless Brass Tubes—

Outside Diameter. Net. Base Price 22¢

Stubs' W. G.	1/4	5-16	3/8	7-16	1/2	9-16	5/8	3/4	1	1 1/4	1 1/2
4-12
12
13
14
15
16
17
18
19
20
21
22
23
24
25

Iron Pipe Sizes—Brass

1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100
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Brazed Brass Tubing.

Discount from List June 6, 1898, 2 1/2%.

Bronze and Copper Tubing advance on Brass List 3%

Roll and Sheet Brass—

Discount from List June 6, 1898, 1 1/2%.

Spelter—

Western..... per lb 6 1/4¢

Zinc.

No. 9, base, casks, per lb 8.25¢ | Open..... per lb 8.75¢

Lead.

American Pig..... per lb 6 1/4¢

Bar..... per lb 7 1/4¢

Solder.

1/2 & 1/2, guaranteed..... per lb 22¢

No. 1..... per lb 20 1/4¢

Refined..... 18 1/2¢

Prices of Solder indicated by private brand vary according to composition.

Antimony—

Cookson..... per lb 14 1/4¢

U. S..... 14¢

Hungarian and Japanese..... 13¢

Aluminum—

No. 1 Aluminum (guaranteed over 99% pure), in ingot for remelting:

Small lots..... per lb 39¢

100-lb lots..... per lb 37¢

Old Metals.

Dealers' Purchasing Prices Paid in New York.

Copper, Heavy Cut and Crucible..... per lb 16 1/4¢

Copper, Heavy and Wire..... per lb 16 1/4¢

Copper, Light and Wire..... per lb 15¢

Heavy Brass..... per lb 10 1/2¢

Light Brass..... per lb 8 1/2¢

Lead..... per lb 5 1/2¢

Tea Lead..... per lb 4 7/8¢

Zinc..... per lb 4 7/8¢

No. 1 Pewter..... per lb 3¢

No. 2 Pewter..... per lb 2¢

Pure Aluminum, Sheet..... per lb 22¢

No. 1 Yard Wrought..... \$8.50

Wrought Pipe..... \$14.75

No. 1 Machinery Cast..... \$14.00

Stove Plate..... \$11.00

THE IRON AGE

The oldest paper in the world devoted to the interests of the Hardware, Iron, Machinery and Metal Trades, and a standard authority on all matters relating to those branches of industry.

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